RAILROAD GAZETTE

FRIDAY, APRIL 28, 1893.

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Contributions.

Firebox Seam Protector.

Ferro Carriles del Sur del Peru,
AREQUIPA, PERU, March 22, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Feb. 3 (page 88) I notice an article, with an illustration, of Mr. J. W. Davis' firebox seam protector. As I gather from your remarks that you assume the "seam protector" to be something recently devised, I cannot refrain from stating that we have used firebox seam protectors on this road for the past 16 years.

Further, we never think of putting a patch on a firebox without providing it with a protector. As it is frequently impossible to calk a patch properly, if left without a protector it would assuredly leak. Our protectors have the same advantages as the one illustrated, but are made of cast iron, supported by two studs and secured in position by nuts. They are certainly much cheaper than wrought iron protectors, and probably almost as durable.

J. G. BEAUMONT.

Large Cars and Small "Waggons."

TO THE EDITOR OF THE RAILROAD GAZETTE:

One of the points on which an American railroad man plumes himself when comparing this country with England is the size of his freight cars. His cars are very much larger than the English freight cars and will carry heavier loads in proportion to their weight, and as he points with pride to the decimal fractions in which he reckons his cost of carrying per ton mile, he does not forget that his large freight cars have played a principal part in bringing the figures down. It is quite true that with the large cars now in use on American railroads it is possible to move grain, coal, lumber, and other coarse freight in large lots more cheaply than in the smaller English "wagons," but when we try to move high class freight in small lots we find the size of the cars a positive disadvantage, and that in more ways than one; and the time is coming when those of us who are level headed will modify our boasting somewhat.

When the conductor of a local freight train, a "package train" as it is called on some lines, encounters a 60,000-lb. box car loaded full with a miscellaneous cargo of merchandise for various points on his division he can usually make up his mind that he will not get home to supper that evening. Even if the articles in the car have been loaded with a due regard to the order in which they must be taken out it is a serious matter to get the various packages disentangled from each other, and the time spent in unloading a given lot of freight from such a car is considerably greater than that spent in unloading the same amount from a number of lighter cars. Now the conductor of the local train is anxious to make time, and every one on the division is anxious to have him make time, so that in actual practice the conductor, either by direct solicitation of the agents at the larger stations, or through the interposition of his trainmaster or superintentendent, generally gets the cars so loaded that he can unload the freight conveniently. But this means that where large cars are used—and on some roads there are comparatively few small cars left—the local cars are loaded very much below their capacity.

Near large cities where there are many passenger trains it is specially important that local freight trains shall not block the main track, and at many such points it has become necessary to wholly discontinue unloading freight from the train. The freight business of such points can then only be handled in "straight cars," and if this business has to be handled with anything like promptness these straight cars must be moved daily, whether they contain ten tons or ten hundred weight, or even less. This adds materially to the number of these large cars which are moved with loads very much below their capacity.

Competition between railroads adds also to the number of such cases. Shippers well understand that when their freight goes through without transfer it arrives at destination not only in better condition, but in quicker time, and so in order to secure freight, railroads will run cars through without transfer to points thousands of miles away with loads of three tons, two, or even one ton. Sometimes this light loading is excused by the fact that empty cars are always moving in the direction of these shipments; but it must be remembered that cars loaded through in this way are usually moved in through freight trains scheduled at high speed. It is the usual practice to estimate the load of an engine as so many loaded or so many empty cars, and though the engineer may, perhaps, admit that his train "hauls easy" this would never reconcile him to the hauling of more cars than does another man with the same kind of engine. On some roads it is recognized that cars loaded with coal, grain, etc., "pull harder" than box cars loaded with merchandise, and more of the latter are reckoned for a train load, but on many roads, perhaps most, no distinction is made between box cars, so that the actual cost of moving a loaded box car is practically the same, whether it contains 60,000 lbs. of freight or only one-tenth that quantity.

Again, delays to trains and expense in handling are not the only evils for which large cars are responsible. When a large car, loaded to the roof with miscellaneous goods, arrives at a station it takes much longer to get the goods out and delivered to the consignees than it would if they were more accessible. The door of a large box car is comparatively small and only a limited number of men can be set to work to get the freight out. The loading of these cars is also a slow operation, if they are loaded to anything like their capacity with miscellaneous goods, so that when we attempt to run freight on quick time we find that trains cannot be started until some time after the last freight comes in; but the goods must be ready for the consignee very early in the morning, and so this delay at both ends necessitates a greater speed on the road, lighter trains and greater expense.

It is thus clearly apparent that while we are at an advantage over the English in handling train loads of low class freight in our large cars *they* are at a decided advantage in handling small lots of high class freight in their small cars. Even their system of loading high class freight in open cars and protecting it with tar paulins, which is so amusing to Americans, enables them to load and unload such freight very quickly, especially as they can use with their open cars such mechanical devices as cranes, which are not effective with our box cars. The small size of the wagons enables them to make "straight cars" with paying loads when the amount of freight is much smaller than would make a paying load for one of our cars, and the large number of "straight cars" thus secured enables them to move their local freights with greater promptness than we can move ours, inasmuch as practically none of the freight has to be unloaded by the trainmen. It is true that the English are much helped in making these straight cars by the fact that their stations are fewer and farther apart than are ours, and this again helps them in making fewer stops with their trains.

As the margin between earnings and expenses grows smaller, and as the proportion of high class business increases to something like its proportion in England, it really looks as if the American railroads would be forced into the use of smaller cars for their shipments of high class freight, especially for short trips where this traffic is somewhat regular. The opposition will come from the car departments. They, naturally enough, will not want more than one standard of box car; but when it is clearly seen how much money is being wasted by the use of the large cars in a service for which they are not adapted, their objections will have to give way.

A. Z.

Convention of State Railroad Commissioners.

The fifth annual convention of railroad commissioners was held at Washington, D. C., April 19 and 20, as briefly noted in our last issue. There were present Interstate Commerce Commissioners Morrison, Knapp, McDill and Clements; and the following State Railroad Commissioners: Woodruff and Seymour, of Connecticut; Cantrell, Lope and Gohan, of Illinois; Dey and Perkins, of Iowa; Mortland and Chadbourn, of Maine; Sanford, Stevens and Dale, of Massachusetts; Mills and Becker, of Minnesota; Hennessey and Cowgill, of Missouri; Cogswell, of New Hampshire; Wilson and Beddingfield, of North Carolina; Cameron, of North Dakota; Kirby, of Ohio; Brown (Deputy Secretary of Internal Affairs), of Pennsylvania; Freeman, of Rhode Island; Duncan, of South Carolina; Pingree, of Vermont; Hill, of Virginia, and Thompson, of Wisconsin. There were also present Messrs. Clifford, Riebenack, Hillyer, Sturgis, Healion and Little, of the Association of American Railway Accounting Officers.

The first business was the reading of the report of the Committee on Reasonable Rates. This report referred to the information gathered by the similar committees of 1891 and 1892, and discussed the conditions of ratemaking in a general way. We quote the closing portion of the report:

It has been said that these corporations, "having in their hands the commerce of the country, are at will able to build it up or impoverish, and are a source of danger to the prosperity of the republic; that the state must control the railroads, or the railroads will control the state." The experience of the past does not indicate any immediate danger from this source. Our federal, state, county, city and town authorities are in the habit of asserting themselves; they do not seem to lack power, and never hesitate to act when the emergency arises. It is not the habit of the American peopleto allow their rights to be infringed, and the larger and more powerful the corporations the more solidly we find them arrayed against their influence. Whenever public opinion is aroused by the thought that the country is being managed by corporations for their own purposes and against public interest, the action is prompt, fearless and decisive, not always just, but asserting itself in no measured tones.

There is a great deal of force in the position that when there are two parties to a contract and one is empowered to make terms, and the other, by reason of his unfortunate situation, is unable to deal with any one else, that strict justice is rarely meted out. It is true that the theory on which the railroads in the United States have been built was that competition would regulate and furnish all reasonable rates. This it has done at competitive points generally, often at the expense of the local shipper. For this situation we see no relief except from legislative action direct or through railroad commissions. The latter in some of the states are authorized to fix a standard above which rates may not be made. While this may be a wise solution of the difficulty, it is a serious question whether the ratemaking power should not fix a standard below which rates may not go. This action would tend to preserve uniformity, to protect the weaker lines, keep them from bankruptcy or from being absorbed by the stronger.

The law of the carrier requires him to perform the service for a reasonable rate. The railroad freight agent, the shipper, the granger, the politician and the legislator all agree that rates should be reasonable; this is all they seek and all they ask. When they attempt to arrive at what is reasonable, their views are widely different. Who then shall determine? Usually the party who feels aggrieved calls upon the state that has chartered these corporations to fix a standard. What that standard shall be, or how to prescribe some rule, some law, or some formula by which rates may be measured, has been a problem that has puzzled the wisest and most thoughtful minds. Our belief is that this invariable standard cannot be found, and that the nearest approach to it is in some body or commission selected in the states on the model of the Interstate Commerce Commission, whose term of office shall run a number of years, the terms of office alternating so that those of no two members expire at the same time. The long term would have the effect to relieve the incumbent from popular pressure and the temptations to yield that necessarily surround an elective board.

The alternating periods when these terms expire would always insure a majority of the Commission familiar with the subject and with a full knowledge of the difficulties in the way of the right adjustment of rates. With regard to interstate commerce it is hardly possible that the present Commission could reach or investigate the cases that would arise over the entire country; while determining general principles it would evidently be impracticable to apply them to all the individual cases that might arise. It has suggested itself that an inferior or subordinate commission might be formed in each group of states to take up matters where state commissions have no power to act and where the present Interstate Commission, by the immense extent of the field, would be unable to investigate and determine what was or what was not reasonable.

The Committee on Safety Appliances made a report, summarizing what has been done, and asking that, in view of the passage by Congress of the law requiring automatic couplers and air brakes, the committee be discharged. A resolution was offered that a committee be appointed to consider the desirability of prescribing a uniform type of freight car coupler, but it was voted down.

The Committee on Uniformity of Accounts recommended the discontinuance of the assignment of expenses to freight and passenger traffic after June 30 next and also recommended the addition of certain columns to expense accounts after June 30, 1894.* This report was adopted.

The Convention next listened to a paper by Prof. Henry C. Adams, on the usefulness of a government railroad statistical office, and the rest of the afternoon was taken up with an informal discussion on the principles of ratemaking. The substance of Mr. Adams' paper will be found in another column.

The first subject before the convention on the second day's session was uniform classification of freight, but there was no report, and Interstate Commerce Commissioner McDill spoke informally, recounting the difficulties which beset the subject. He did not attempt to give a remedy for these difficulties, but expressed the hope that something might yet be done. Other speakers followed in the same line, and the meeting adopted the same resolutions that were introduced last year, to the effect that uniform classification is desirable, that persistent efforts should be continued and that the Interstate Commerce Commission should lead in these efforts.

The meeting also adopted resolutions that the chair appoint committees as follows: One of five, the statisti-

*The sense of this recommendation is indicated by the following, from the report of last year's Convention, viz.: "Your committee would recommend the transfer of the items mentioned from General Expenses to definite accounts, under the head of Conducting Transportation, thus necessitating the introduction of some new accounts under that heading, such as 'Superintendence,' 'Hire of Equipment,' 'Clearing Wrecks,' 'Oil, Tallow and Waste,' 'Outside Agencies and Advertising,' 'Commissions,' 'Stationery and Printing,' etc.".

cian of the Interstate Commerce Commission to be chairman, to consider the classification of freight revenue according to the character of the freight and the feasibility of having operating expenses divided by state lines; a committee of five to consider abuses caused by use of shippers' cars; a committee of five to consider the subject of pooling, and a committee of five to call the next convention for the second Tuesday in May, 1894. The meeting also adopted a resolution that all members of this and former conventions may be members of future conventions, even if not in office, but not be allowed to vote.

Record of Compound and Simple Locomotives on the New York, Chicago & St. Louis.

There are some well known railroad mechanical officers who contend that in any comparative test of compound and simple locomotives, to determine whether there is any economy due to the compounding feature, this feature should be, if possible, the only point of difference. Also that as many variables as possible should be eliminated, and that satisfactory results cannot be obtained by applying a long, scientific, accurate test to a freight train in regular service. They point out that the results obtained by the committee of the Master Mechanics' Association, which made the long series of tests on the Chicago Milwaukee & St. Paul, were extremely variable, so much so that it was difficult to draw any conclusions from them. The report made by this committee appeared in the *Railroad Gazette* of June 24 and July 1, 1892. It was urged by some that in considering the subject further the committee should confine itself, as near as possible, to a constant train on a regular schedule. These same men feel confident that in freight service the compound locomotive will show an economy of at least 15 per cent. over a simple engine of the same class, an economy of 30 per cent. having been found from performance sheets.

Equally able mechanical engineers contend, on the other hand, that the variables are what make it questionable whether in any service the compound can show any saving over the simple locomotive. They say that a study of Hirn's experiments indicates that even Hirn did not feel satisfied that compounding would give a saving of more than 10 per cent. over the best simple engines; and even that amount could be shown only when the engine could be adapted closely to the work to to be performed and everything kept uniform. These critics sum up their opinion by saying that if tests are made with the variables of actual conditions eliminated no useful information will be obtained.

Both sides, however, are of one opinion in regard to the value of results obtained from performance sheets extending over several months, showing the record of compound and simple locomotives of the same class, in the same kind of service and on the same division, so that in presenting to our readers the following extracts from the performance sheets of the New York, Chicago & St. Louis road, for the months of November and December, 1892, and January, 1893, we are presenting data that is recognized as valuable by both sides. The following table gives the record of nine simple locomotives and one compound locomotive, all built by the Baldwin Locomotive Works. Both classes were used in freight service on the same division of the road. The simple locomotive had cylinders 18 in. in diameter and 24 in. stroke and both classes had six driving wheels, with 50 in. centres, and two truck wheels 28 in. in diameter.

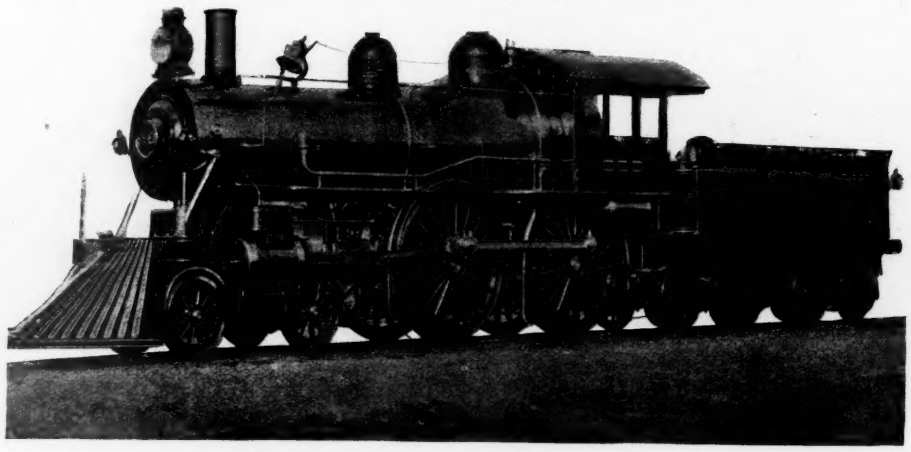
	November, 1892.		December, 1892.		January, 1893.	
	Comp.	Simp.	Comp.	Simp.	Comp.	Simp.
No. of engines in service	1	9	1	9	1	9
Aver. mileage per engine	3,828	4,166	4,618	4,492	4,408	4,369
Cost per mile run:						
Repairs	.039	.008	.020	.015	.021	.013
Wages	.063	.063	.066	.065	.071	.070
Stores	.003	.003	.002	.003	.003	.003
Fuel	.079	.104	.083	.116	.089	.108
Total	.154	.178	.171	.199	.184	.194
Number of miles run to:						
1 quart of lubricating oil	47.0	50.7	56 3	50.7	48.4	48.3
1 quart of l'mp oil	80.0	77.8	118.4	82.7	90.0	73.5
1 lb. of waste	120.0	151.0	165.0	157.3	169.5	205.8
1 ton of coal	21.2	16.0	20 5	14.7	18.0	15 0
Cars per train	32.2	32.05	33.8	32.7	29.2	26.4
Cost p'r car mile	.005	.005	.005	.006	.006	.007
Pounds of coal per car mile	2.8	4.0	3.0	4.3	3.8	5.3

In this table five empty cars are considered equivalent to three loaded ones, and one and one-half cords of wood are considered equivalent to one ton of coal.

Excepting that one compound locomotive is compared with the average of nine simple locomotives, the above table makes a very fair comparison between the two classes. The total mileage per engine for each month is about the same for each class, and the number of cars per train is practically the same. The average consumption of coal per car mile for the three months was, for the compound, 3.2 pounds and for the simple engines 4.53 pounds, which is an economy of the compound over the simple of 29.3 per cent. The average number of engine miles per ton of coal for the three months was 19.9 for the compound locomotive and 15.2 for the simple locomotives.

The New York Central Exhibit at the World's Fair.

The most striking feature of the exhibit of the New York Central & Hudson River Railroad at the World's Fair will be the large new express locomotive, which we describe in another article in this issue, shown alongside of an engine, tender and three cars modeled after the De Witt Clinton and its train of 1831, the first train in the State of New York. The De Witt Clinton has recently been described in these columns, and is familiar to most of our readers from cuts of various kinds which have been published during the past 30 years. The published illustrations differ from each other, however, and we print herewith a copy of the drawing which Mr. Buchanan has followed in constructing the engine which he now sends to Chicago. This drawing is in Mr. Buchanan's possession, together with the original copy of the specifications for the carriages. This is signed by John B. Jervis, who was engineer for the Mohawk & Hudson Railroad in 1831.



Sixty-two Ton Passsenger Lccomotive of the New York Central & Hudson River Railroad.

To be Exhibited at the World's Columbian Exposition.

The De Witt Clinton was built at the West Point foundry, foot of Beach street, New York City, in 1831. It was mounted on four 54-in. wheels. The two cylinders were each 5½ in. in diameter by 16 in. stroke, and the weight of the engine was about six tons. The boiler had 35 copper tubes, 2½ in. in diameter. Mr. Buchanan's drawing differs from that in possession of the American Society of Civil Engineers* chiefly in having a dome. In the engine now built the connecting rods are of wood trussed with iron rods about ½ in. diameter. The tender is an iron tank about 5 ft. wide and 7 ft. long and 15 in. deep. The top is a clear platform, occupied by three casks containing sticks of wood, as shown in Brown's silhoutte.

Trial trips of the engine were made on the Mohawk & Hudson at various times from July 2 to August 9, 1831, on which latter date the first regular excursion trip was made. The engineer in charge was David Matthews, and the conductor John T. Clark, who mounted a small seat attached to the rear of the tender and gave the signal for starting by blowing a tin horn. The fuel used on this trip was dry pitch pine. There was no spark arrester and as a consequence the smoke and sparks poured back on the passengers in such volume as to compel them to use their umbrellas as shields. The coverings of these, however, were soon burnt, and we are told that the passengers after that helped one another to prevent their clothes from catching fire.

The specifications for the coaches are quite general in their terms, having been drawn up by the builder, James Goold, and assented to by Mr. Jervis for the railroad company. The bodies were to be 7 ft. 4 in. long and 5 ft. wide in the centre. There were to be three inside seats, and the contract price was $310 each. The coaches which Mr. Buchanan has built are like the common stage coaches which are still in use in many parts of this country, but, as indicated by the foregoing figures, are of small size. They are painted a plain brown, which, with the black leather work, makes a somewhat somber looking vehicle. We do not remember to have read what color was used in painting the original coaches, but as the excursion was without doubt a festive occasion, we have always imagined a bright colored train, say canary yellow, so that we have a feeling that in adopting the dark color the Central has framed its history in too sober a setting.

The present coaches rest upon very simple wooden under frames, with suitable transverse and diagonal bracing. Each coach has four light cast iron wheels about 26 in. in diameter. The coupling and buffing arrangement consists of a simple hook, so that the difficulty of too much slack, which is reported to have occurred on the excursion of 1831, will make no trouble now.

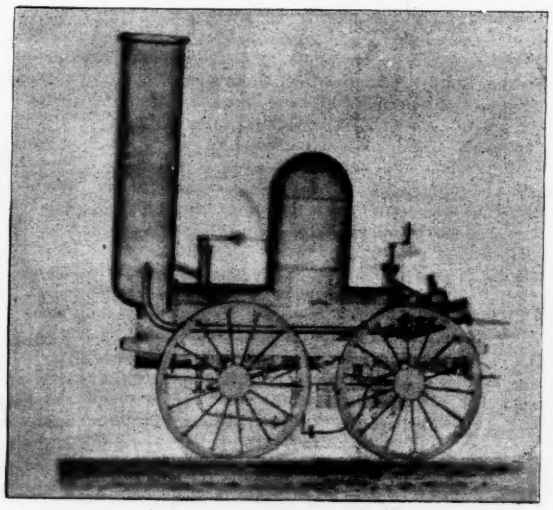
The De Witt Clinton and her train, together with the modern engine, the 999, were exhibited at the Grand Central Station, in New York City, for a few days before being sent to Chicago, and attracted large numbers of visitors. The contrast between the ancient and the modern locomotive was so great that the spectators could hardly make a rational comparison. The mere matter of color and finish, to which we have already alluded, was sufficiently striking, and most observers could only express unlimited wonder. It is to be remembered that the great majority of locomotives with which people are familiar, even those built within the last five years, are considerably less imposing than this latest product of the New York Central shops. The centre of the boiler of this engine is 8 ft. 11½ in. above the rail, while a height of less than 7 ft. is very common. The 999 would therefore be a notable sight, even were the De Witt Clinton not present for comparison. But the stature of the latter is so diminutive that the contrast with the larger engine is hardly less striking than that between the large drawing and the little photograph as they appear in our pages.

* This was published in the *Railroad Gazette*, May 25, 1883.

New York Central Engine for the World's Fair.

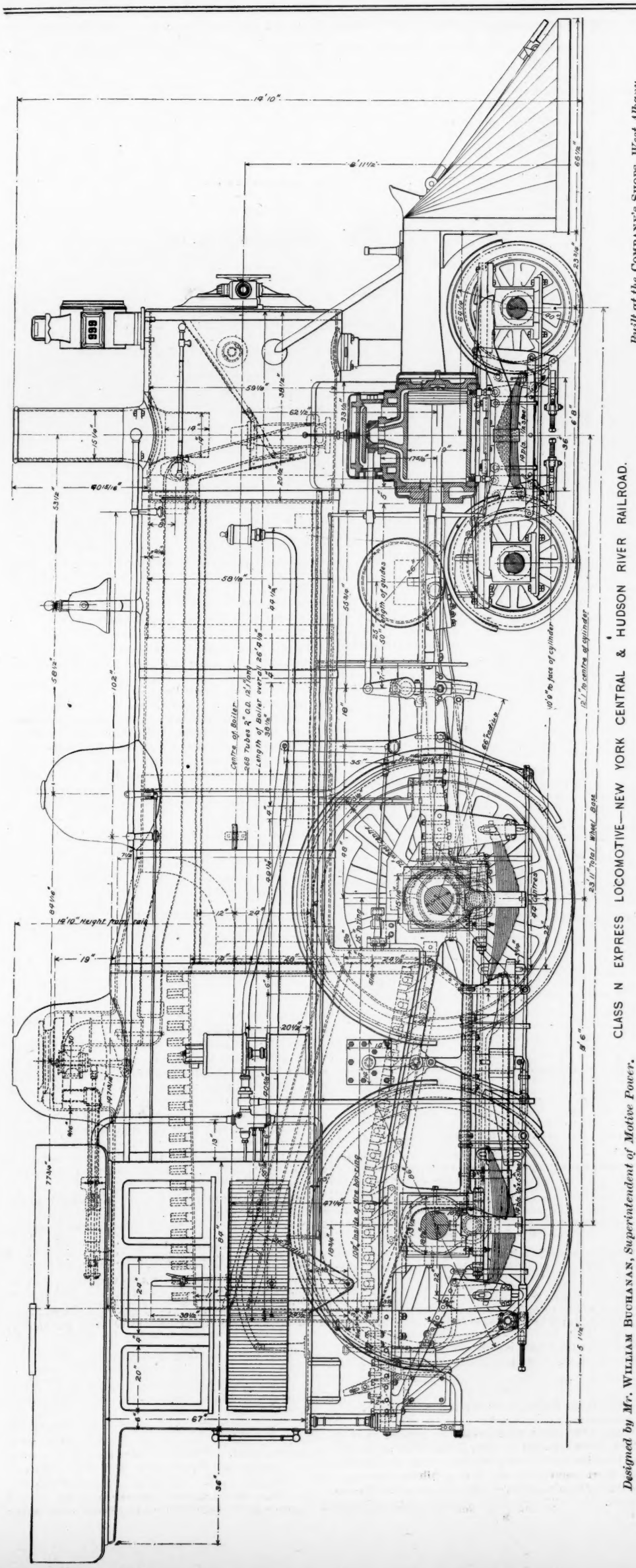
In the fast express locomotive which he has built to be shown at the World's Columbian Exposition, Mr. Buchanan has made an engine which is practically the same as his 903, which has been running several months, except that the heating surface and grate area have been increased about six per cent. This, with the corresponding increase of weight on the drivers, will give an added power which will lead mechanical men to look with interest for the records of the engine in regular service. The new engine, which is 999, class N, is shown in perspective and elevation in the accompanying illustrations, and forms an interesting subject for comparison with the engine already illustrated in the *Railroad Gazette* of April 7, and which it resembles in all essential features except size.

No. 999 is an eight-wheel passenger locomotive, and was built at the West Albany shops of the company. The size of the cylinders has remained unchanged, being 19 in. in diameter by 24-in. stroke. The tires are 3½ in. thick and 5¾ in. wide, secured to the cast iron wheel centres by Mansell retaining rings. The truck wheels are 40 in. in diameter, and the truck has a 6 ft. 8-in. wheel base, the tires also being fastened to the cast iron spoke centres by Mansell rings. The total wheel base measures 23 ft. 11 in.



The "De Witt Clinton," of the Mohawk & Hudson Railroad, 1831

The boiler is of the wagon top type. The firebox is of the Buchanan type, with water arch, and is set on top of the frame. It is 108 in. long and 40⅛ in. wide. The total heating surface is 1,930 sq. ft., with a grate surface of 30.7 sq. ft. The smokebox is extended and is fitted with a deflector and a perforated steel plate spark arrester. The exhaust nozzles are double, 3½ in. in diam-



CLASS N EXPRESS LOCOMOTIVE—NEW YORK CENTRAL & HUDSON RIVER RAILROAD.

Designed by Mr. WILLIAM BUCHANAN, *Superintendent of Motive Power.*

Built at the COMPANY'S SHOPS, *West Albany.*

eter. The boiler is designed to carry 190 lbs. pressure per square inch. The tender has a coal capacity of 6¾ tons, and carries 3,587 gallons of water. It is fitted with a water scoop, and is carried on two four-wheel trucks, each 4 ft. 5-in. wheel base, with 40-in. cast iron spoke wheels and steel tires secured by Mansell retaining rings. The engine has a Nathan injector. All the wheels of the engine, including those of the front truck and those of the tender, are fitted with the Westinghouse air brake, and the engine is equipped with the Air signal whistle

For more convenient comparison some of the main dimensions are herewith tabulated :—

Cylinders	19 in. × 24 in.
Dia. of driving wheels outside of tires	85 in.
Dia. engine truck wheels	40 in.
Springs, length of driver, centre to centre of hangers	44 in.
Total length of boiler	26 ft., 4⅛ in.
Dia. of first ring outside	58 in.
Size of firebox	108¾ in. × 40⅞ in.
Tubes, 268	2 in. dia., 12 ft. long
Heating surface in tubes	1,697.45 sq. ft.
" " " firebox	232.92 sq. ft.
Total heating surface	1,930.37 sq. ft.
Grate surface	30.7 sq. ft.
Stack, inside dia	15¼ in.
Weight in working order	124,000 lbs.
Weight on drivers	84,000 lbs.
Driving wheel base	8 ft., 6 in.
Weight of tender loaded	80,000 lbs.
Total weight of engine and tender	204,000 lbs.
Extreme length of engine	39 ft., 6¾ in.
Extreme height from top of rails to top of stack	14 ft., 10 in.

The new engine differs in outward appearance from the last previous one built for the Empire State Express, chiefly in the more handsome finish. All the iron and steel parts usually left bright have been polished with unusual care, and the injector pipes and some other parts are nickel plated. The lettering and striping is in silver leaf. The striping on the cowcatcher is especially effective. The round headlight case gives the front elevation, which, from an æsthetic point, is a difficult matter to handle in such a large engine, a very harmonious appearance. The cab is of black walnut, and the interior of the roof is made of alternate stripes of black walnut and a light colored wood. All the painted parts are well varnished, even to the coupler at the rear of the tender. The tender is inscribed "The Empire State Express."

Tests of Locomotives in Heavy Express Service.

The meeting of the Western Railway Club on March 21 was devoted principally to a discussion of the paper on the above subject which was presented by Mr. Forsyth at the February meeting. First came a written communication from Mr. Cleaver, of the Vandalia, who said :

It struck me that the conclusions arrived at by Mr. Forsyth as to the per cent. of the total power required by the engine itself at speeds of 40 to 60 miles per hour (30 per cent. to 40 per cent.) was too low. The Vandalia Line has had a great deal of experience in running heavy express trains at high average speeds with numerous stops, and the results of increasing the size of the locomotives for these trains have indicated that a much smaller per cent. of the increased power was transmitted to the train than was anticipated. In order to demonstrate this point, one of the regular engines hauling our fast train No. 20 from East St. Louis to Terre Haute was run over the division light exactly on schedule time, and the following trip with the regular train, the consumption of coal and water being measured during each trip.

The engine was No. 193, ten wheel, 72-in. drivers, 64-in. boiler; weight 139,000 lbs., on drivers 106,000 lbs.; heating surface, 2,054 sq. ft. The weight of the cars in train was 643,000 lbs., making the total weight of engine, tender and train, 424 tons. The length of the trip was 165 miles, card time 4 hours, 17 minutes. Time including regular stops but excluding an extra delay of 16 minutes, 4 hours and 5 minutes. Average, 40.4 miles per hour. Deducting 2 minutes for crossing and station stops, 4 minutes for water stop, and 7 minutes for connection stop would reduce the time to 3 hours and 35 minutes, or an average of 46 miles per hour.

PERFORMANCE OF ENGINE.

Train	Estimated Wei't	W't of Eng & Train	Steam press'r pounds	Coal consumed pounds	Water Evaporated pounds	Pound water evap'd to lb. coal
8 cars.	321 tons	424 tons	130 to 160	1582S	63528	4.01
No train		103 tons	140	2810	26750	9.55
No train		103 tons	140	6670	26750	4.01*

*Corrected fuel consumption.

Engine 193 running over the division light was being operated with the most economical fuel consumption possible, as is shown by the high evaporation, 9.55, the steam pressure being maintained at 140 lbs. to avoid blowing off at the pop valves; but when pulling the train the conditions were just the reverse, as shown by the low evaporation, 4.01. In the above table, line 3, the water evaporation of 26,750 lbs. is taken to represent the power consumed by the engine itself. This divided by the evaporation of the engine when in regular service gives 6,670 lbs. of coal chargeable to the use of the engine alone, which is 42 per cent. of the total amount consumed. When it is remembered that 14 stops were made, and consequently a large proportion of the time the train was running at less than 30 miles per hour, at which speeds it is recognized that the proportion of locomotive resistance, if I may call it so, is much less than at higher speeds, then I cannot be far wrong in assigning to the engine 50 per cent. of its own power at speeds of 55 and 60 miles per hour. The time schedule shows that for long distances the train was hauled at a greater speed than 60 miles an hour, notably from Teutopolis to Jewett, 13.7 miles in 13 minutes, and yet the average time for the whole run is only 40.4 miles per hour, clearly indicating that if express trains of over 400 tons weight are to be run at an aver-

age speed of 40 miles an hour, including stops every 15 or 20 miles, with sufficient surplus power to make up one minute of delayed time in every ten minutes run, the locomotive must not only have sufficient power to get the train quickly up to a high speed but must be able to maintain under fairly good conditions a speed of 65 miles an hour between stations. It is our experience that this latter qualification is more quickly affected by slight changes in the diameter of the exhaust tips than in any other way, indicating the existence of excessive back pressure, which it is impossible to relieve and still maintain full boiler pressure.

In designing heavier engines the same proportion of cylinders to boiler is usually maintained, and in some cases even a larger ratio of cylinders to boiler is used. Would it not be better to put all the increase in weight into the boiler, thus allowing much larger exhaust nozzles to be used, the engine gaining power and speed from a reduction of the back pressure? Starting with a boiler as usually designed for an 18 × 24 engine, and increasing its size each time a demand is made for more speed a boiler of the size of engine 193 would soon be reached. This boiler is almost the limit in size unless built of the Wootten type, as it has been found impracticable for the ordinary fireman to properly place soft coal in a firebox over 10 ft. long when in fast express service. If this is the case when in future demands are made for higher speeds with heavier trains, there seems nothing to turn to but the compound engine, as our capacity for generating steam having been reached we may turn our attention to its more economical use; but if no better results can be obtained than appears from the reports of tests of the Baldwin compound the outlook is not favorable. However, from a series of tests with a compound engine on this line, I am inclined to think that the poor results obtained from the compound in question were due not to the principle of compounding, but to a wrong application of it. Dec. 1, of last year the Pittsburgh Locomotive Works placed at our disposal a ten-wheel compound engine to be tested and used as we thought fit. An engineer accompanied the engine, but only to instruct our men in the handling of it. Several of the trips were made without him. The engine was used in freight service, and experienced the usual delays. The engine was in service on our line three weeks. Simple ten-wheel engine 125, received new from the Pittsburgh Locomotive Works about a month previous, was tested against the compound—the outside dimensions of the two boilers and the fireboxes were the same—the staying and sheets in the compound boiler being increased to admit of carrying 180 lbs. of steam, the simple engine carrying 165 lbs. The compound had 3½ in. water space around firebox, and the simple 4 in., reducing the grate service of the latter 1½ sq. ft. Both engines were handled by the same crew. The tests show a saving of 24 per cent. in ton-miles per pound of coal for the compound engine. The point may be raised that this was done in freight service, but an examination of the time column will show that after deducting as delays the time actually consumed standing still at stations, some trips of 73 miles were made in three hours and forty-two minutes. After deducting from this the time consumed getting in and out of side tracks and climbing grades, the speed approaches very closely that of fast passenger service. As a matter of fact about 40 per cent. of the time both engines were running from 30 to 50 miles per hour. If under these conditions the compound engine can show a saving of from 16 to 24 per cent. there must be something in the principle that will apply to advantage in heavy express service.

One feature of this engine not common to all compounds is the ability to work simple as long as desired. A number of times the engine would have stalled working compound when the speed was unexpectedly slackened at difficult places, but by throwing it into simple the train was pulled through. By arranging an engine so as to change into compound automatically after a few revolutions, as is customary, the full power that could be made available is arbitrarily reduced, yet in the service under discussion when sidetracking it is frequently necessary for the engine to handle a string of freight cars in addition to its own train, and many minutes' delay results from lack of power to do this promptly.

This communication was accepted and ordered printed in the proceedings. Discussion on the subject was then opened as follows:

Mr. D. L. BARNES: Mr. Cleaver shows a saving of 15.5 per cent. in evaporation of the water in the boiler, and yet the records only show 16 per cent. saving for the engine. The 15.5 per cent. saved in evaporation is practically equal to the 16 per cent. saving in the coal used. Therefore, taking the records as they stand, the saving of the evaporation in the boiler alone accounts for the gain in the engine. Then the engine has 15 lbs. more boiler pressure and nearly 200 ft. more heating surface; so there is, outside of the compound feature of the engine, considerable reason for expecting a saving. When running without train the engine was running probably at 2-10 cut-off and throttle partly closed. In this way the steam is not used economically. There is difference enough in the way the engines were run with and without the train to account for the difference between Mr. Cleaver's results and those given in Mr. Forsyth's paper.

Mr. J. N. BARR: We have two specially built engines. One with grate 78 in. × 34 in.; the other with a grate about 102 in. × 42¾ in., and so far as steam is concerned the one with the 78 in. × 34 in. grate steams better than the one with the 102 in. × 42¾ in. There is a happy medium to be reached in all cases of that kind. Possibly the small grate is so much better covered in firing that it gives better results. I have tried an experiment with the grates about 4 in. narrower than the standard, and there was general complaint that the engine did not steam well. Whether it was the amount of surface taken off or not, I am not prepared to say.

Mr. BARNES: In Mr. Cleaver's and other tests I find that whenever the coal burned per square foot of grate is reduced materially, there is a decided gain in the evaporation per pound of coal, and this within quite wide limits. A locomotive boiler can handle and properly burn up to about 50 lbs. per square foot of grate per hour, and after that there is a marked depreciation in the evaporation as the coal consumption increases.

Mr. Forsyth's method adopted to determine locomotive resistanee is practically correct; that is, the difference in power exerted in the steam cylinders as measured by the indicator and the power exerted on the drawbar of the dynamometer car represents pretty accurately the power consumed by the locomotive as a whole. The other deduction made as to the amount of the air resistance and internal resistance of the engine is the final remainder of two different subtractions, and therefore we may expect that it contains all of the errors, if any, that existed in the numbers with which the subtractions were made. If there was an error in the dynamometer car records or in the indicator work, these errors are amassed in the final remainder, which gives the air resistance and internal resistance of the engine. An error of 5 per cent. in the indicator work and another 5 per cent. in the dynamometer records might give an error of 10 per cent. in the air resistance and internal resistance of the engine. For this reason I think that while the total resistance of the engine as given is quite correct, yet the air resistance and the internal resistance of the engine may vary somewhat from the figures given. I have made a number of analyses of this sort, and the results agree quite closely with those given by Mr. Forsyth, which tends to show that the air resistance is not anything like what it is ordinarily considered to be. Those who have advocated the use of pointed prows on locomotives, in order to reduce the head air resistance, will find quite sufficient proof in Mr. Forsyth's paper of the folly of such a plan for any ordinary speed. As Mr. Forsyth has pointed out, the difficulty in gaining high speeds with locomotives lies not with the enormously increased resistance at high speeds, but with the greatly reduced power of the locomotive.

The method pursued by Mr. Forsyth is much more accurate than running an engine by itself over the road. The only probable error of any amount in Mr. Forsyth's method lies in the omission of the steam condensed in the cylinders, which is not shown by the indicator card. This condensation may vary from 25 to 40 per cent., according to the point of cut-off and other conditions; but where two single expansion locomotives of nearly the same power are hauling practically the same train, the difference in cylinder condensation would not amount to very much.

It is safe to conclude within reasonably wide limits that of two engines, if one shows by the indicator cards that less power is given out for each heat unit in the steam used, the least economical engine will be the one which does the least work for each heat unit. In some analyses I have made I have found almost invariably that the gain in economy of the compound engine could be determined directly from the indicator cards. Whenever the compound engine was shown to be more economical than the simple engine, the indicator cards showed that the compound was doing more work for each heat unit in the steam used, the steam being measured from the indicator card.

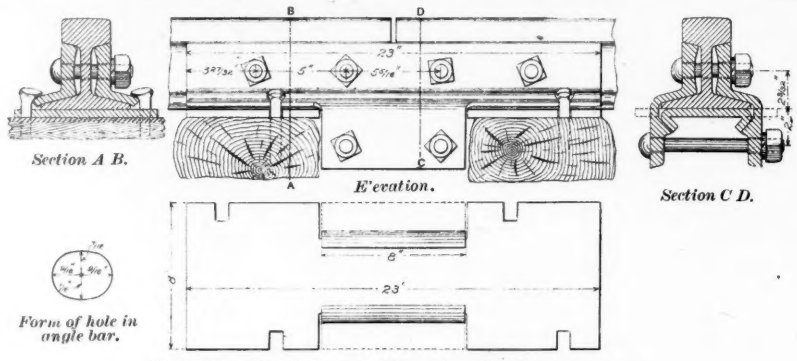
In reading the acceleration diagrams in Mr. Forsyth's paper it must be observed that the locomotives were not pulling as hard as they could. The diagrams illustrate the fact that while a very heavy engine may be needed to start a train and to accelerate it up to about 30 or 40 miles an hour, yet beyond that point a lighter engine will do quite as well, provided it has enough cylinder and boiler power. This arises from the fact that the cylinder power of locomotives decreases very rapidly as the speed increases, and even with engines having larger cylinders the cylinder power is so quickly reduced as the speed increases that the weight on drivers is very much more than is necessary to furnish sufficient adhesion to utilize the reduced cylinder power; that is, a small engine having a good valve motion which gives it considerable cylinder power at high speeds, may accelerate a train to 60 or 70 miles an hour in a shorter distance and in less time than a larger engine with defective valve gear or a valve gear that is designed for slower speeds.

The indicator cards taken from the engines during the test are quite as important as the dynamometer diagrams. This is so because the speed was very uniform, as is shown by the speed diagrams. This gives the indicator cards some real meaning, and a comparison of the cards ought to give a close approximation to the comparison of the efficiencies of the engines, and this I find to be true.

Mr. Barnes then went into an elaborate comparison of various tests, which we must postpone to a future issue.

Sixty-Foot Rails on the Norfolk & Western.

There is obviously a great advantage in using rails 60 ft. long in the one item of doing away with about the most troublesome feature of railroad track; that is, the joint. The elimination of one-half the joints on any railroad will at once remove a constant source of trouble and expense. The most extensive experiment that we have heard of in this direction is being carried on on the Norfolk & Western. On the Maryland & Washington Division of that road there are 7 milesof 60 ft. rails weighing 67 lbs. per yard. These are cut with mitred ends, and laid with the ordinary angle bar, and have given good satisfaction. The track is much smoother than other track laid with rails of the same weight in lengths of 30 ft. and with square ends. On other sections of the road, subject to the heaviest traffic, there are now in service 18 miles of 60 ft. rails weighing 85 lbs. per yard, with square ends, laid with the joint that is shown herewith. This weight and section is now standard for renewals and is being constantly put in the track. One section laid with this rail is a single track between two pieces of double track. It is on a grade of 80 ft. to the mile where pusher engines are used. Over this track there pass on an average 33,000 cars and 1,275 locomotives a month. With the standard joint the rail ends do not move under the loads, and there is little shock at the joints, and the track remains in better surface than the 30-ft. rails with angle bars. On another section of the road, with the same rail and joint, a still greater number of pusher engines is used.



Underside of tie-plate; dotted lines show plate before being bent.

Standard Joint for 85-lb. Rail—Norfolk & Western Railroad.

The rail was laid on these sections without any interruption to traffic, and it was found possible under this constant traffic to lay from 1,500 to 3,000 ft. of track a day. The force required was about 30 men, divided as follows: 10 men removing old rails, 16 putting in new rails and four putting on joints. The cost per mile of laying the rails varied on the two sections from $275 to $350, the variation being attributed to the difference of interruption from trains and pusher engines. The average for a large section of road is placed at about $300 a mile. The supervisors report that there is no appreciable difference in speed of laying with 60 ft. or 30 ft. rails.

No especial difficulty has been found in shipping these long rails. The method of loading them is shown in the sketch herewith. Nor is any difficulty found in handling them; a few more men are required than would be required for 30-ft. rails; but, on the other hand, there is a saving in the less number of joints, which saving, of course, goes on in maintenance.

Plan of Loading 60-ft. Rails—Norfolk & Western Railroad.

Seven cars for three loads of 34 rails each; rails 60 ft. long, 85 lbs. per yard.

The mills make no objection to supplying 60-ft. rails provided the company will accept a certain portion of rails of 30 ft. length. The specifications of the company stipulate that while the standard length shall be 60 ft. at 60 deg. F., 10 per cent. of the entire order will be accepted in the following lengths: 26 ft., 28 ft., 30 ft., 52 ft., 54 ft., 56 ft. and 58 ft. A maximum variation in length of ¼ of an inch longer or shorter will be allowed except in the case of 60-ft. rails, where the maximum variation is ½ an inch. Some extracts from the specifications follow:

The steel shall conform as nearly as possible to the following analysis:

Carbon	from 0.45	per cent. to	0.60	per cent.
Silicon	" 0.08	" "	0.09	"
Manganese	" 0.90	" "	1.10	"
Phosphorous	" 0.07	" "	0.08	"
Sulphur	" 0.00	" "	0.04	"

While the heat is being cast two test ingots shall be made. The first from steel going into the first regular ingot, the other from metal representing the last one. The test ingots shall be 3 in. × 3 in., and not less than 4 in. long. From them bars at least ½ in. square, shall be drawn at one heat by hammering. Each bar shall be bent without breaking by the blows of a sledge to not less than a right angle. Should one bar from a heat fail and the other stand test, a third bar may be taken from a bloom rolled from the same ingot represented by the failed bar. If this stands the test, it shall be accepted in lieu of the failed one. If the makers choose, more than two test ingots may be taken, but they must be from the steel of the first and last regular ingots. If this is done, and a test bar fails, one may be drawn from the duplicate ingot and tested, and, if it stands, accepted. A test bar ¾ in. wide and 10 in. long, taken from the web of a rail made from each charge, is to be furnished to the railroad company's inspector for use in making analysis and test of steel if called for.

The causes for temporary rejection of rails are crooked rails, rails with imperfect ends which after being

cut off would give a perfect rail of one of the shorter lengths, missing test reports and a variation of more than ¼ in. or ⅛ in. as stated above. The inspector shall have power to reject rails made from insufficiently sheared blooms, from "chilled" heats or from bled ingots, the rails made from heats the test reports of which have failed, or the carbon in which is not in accordance with the above specifications; the rails made from heats having no test reports; rails not conforming closely with all the above requirements.

NORFOLK & WESTERN STANDARD RAIL JOINT.

The standard joint to which reference is made above is shown in the engraving. This, we believe, was designed by Mr. C. S. Churchill, Engineer Maintenance of Way, who makes the following statements of what he considers the qualities of a perfect rail joint.

I. It must hold the rails rigidly in place so that either end cannot move the least fraction of an inch in any direction, except for expansion, and so that the wave or general deflection of the solid rail under traffic may pass unbroken through the joint.

II. It must be, when in its proper position, practically as strong as the rail itself in whatever direction the strain may be applied.

III. It must be so proportioned as to effectively care for the strain caused by the wheels passing over the space between the rail ends and so as to convey that strain directly to the joint ties.

IV. It must be proportioned and applied so as to absolutely prevent creeping of the rails, and yet must, when securely fastened, allow for the expansion and contraction of the rails during changes in temperature.

V. The point of union of two rails being naturally the danger point of the track, the rail joint must be so proportioned as to furnish extra means for the support of the rail upon and for the fastening of the rail to the joint ties.

VI. It must be designed so that corrosion or wear of any of its parts can be readily taken up by tightening of the various bolts.

VII. It must be of such a design as to be made readily to fit perfectly any form of "T" rail in use, and must preferably be applicable to any of the rail punchings commonly used.

VIII. It must be of as few parts as possible consistent with the end desired.

The ordinary angle bar fails wholly in requirements Nos. 1, 2, 3 and 5; it partially fulfills requirements Nos. 4 and 6, and wholly only Nos. 7 and 8.

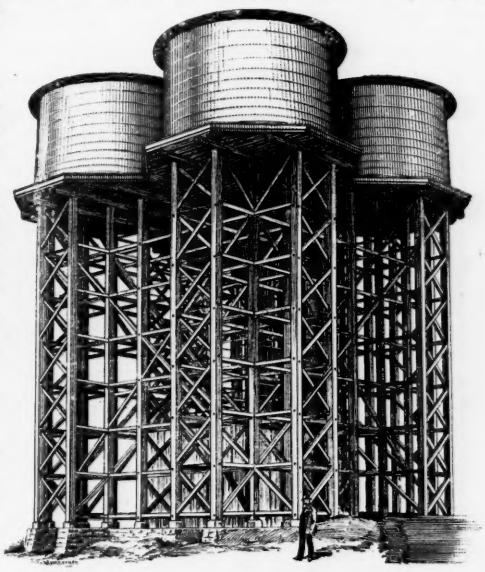
Rail ends at the joints are subject not only to a downward strain and a side strain under traffic, but also to an upward strain fully equal to the downward one. This last strain can only be provided for by a joint that supports the ends of the rail from beneath, and such a joint is the only one that will fully comply with requirements No. 1. The angle bar, whether long or short, is a total failure in this.

Standard Spring Rail Frog, Norfolk & Western Railroad.

The spring rail frog standard on the Norfolk & Western Railroad is so well illustrated in our engravings that it would be mere repetition to attempt to describe it. The dimensions and parts are fully shown. This is the frog to which Mr. C. S. Churchill, Engineer Maintenance of Way, Norfolk & Western Railroad, referred in the paper on High Speed on Railroads which he read last fall before the Engineers' Club at Philadelphia. He dwelt in that paper, it will be remembered, especially on the vital importance of thorough preparation of track in all details before very high speeds should be attempted, and among other things said that spring rail frogs seemed to answer the requirements from the present point of view, but they should be of improved pattern. They should be built on a ¾-in. plate; the wing rail should have the spring placed near the end, should have a lever to hold it in position, and the top of the wing rail should be beveled to prevent possible forcing open of the wing rail by badly worn engine tires.

Some Tall Tanks.

The illustration shows a group of four tanks recently erected by Fairbanks, Morse & Co., of Chicago, at the Depew shops of the New York Central & Hudson River Railroad. These tanks have a combined capacity of



200,000 gallons. The floor of the tanks stands 50 ft. from the foundation. The illustration is from a photograph, which does not give a just notion of the tanks, inasmuch as the conical roofs are entirely out of sight. It does give, however, a very fair notion of their height.

Publicity of Accounts as a Means of Controlling Railroads.*

A rapid survey of the history of internal communication in the United States shows that four distinct views have been held respecting the relation of public highways to government. Previous to 1830 it was commonly accepted as the proper function of the Federal government to supply the public with turnpikes and canals, the only important public work undertaken by a state prior to this time being the Erie Canal. With 1830, however, the sentiment of the country entirely changed. The constitutional right of Congress to build and manage public highways within the boundaries of the sovereign states was questioned. The veto by President Jackson of the Maysville road bill transferred the centre of activity from the Federal government to the several states, and from 1830 to 1850 the question of internal improvements brought state governments prominently into view. I need not speak of the financial disasters which resulted from this endeavor on the part of the States to build railways and canals. Suffice it to say that by 1850 public sentiment experienced another radical change, and the people of the states adopted numerous amendments to their constitutions which forbade the use of public credit for commercial purposes. At present there are a large number of provisions of this sort in the state constitutions.

The third phase of public opinion, which may be said to have been entered upon by 1850, regarded private corporations as the proper organizations for building and controlling railroads. It will be remembered that at this time the extreme ideas of English political economy respecting the narrow functions of government were quite prevalent, and it is no occasion for surprise to notice that when ownership and control of railroads was handed over to private corporations, the governments of the several states did not consider it necessary to retain any voice in their management. It was believed that competition would work with regard to this industry in a normal and satisfactory manner, and that consequently there was no necessity for government to provide for the exercise of any control or supervision.

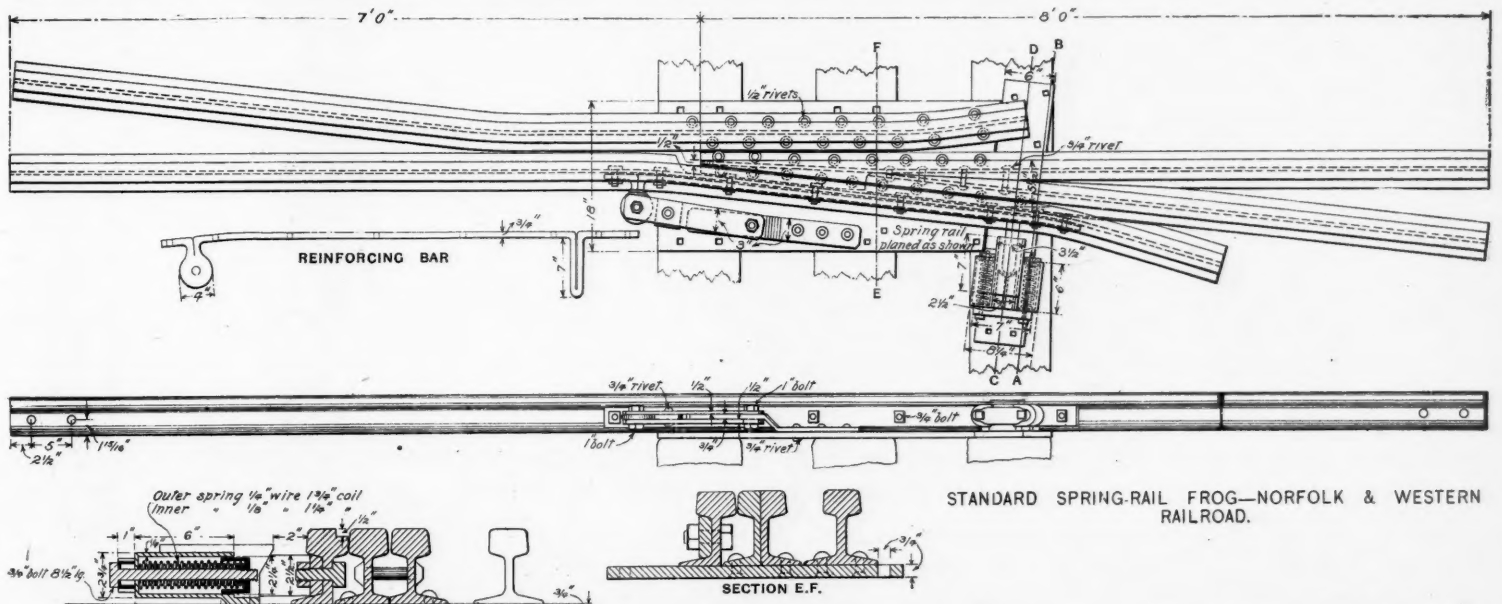
This sentiment prevailed until about 1870, when it was found, especially in certain of the Western states, that an irresponsible administration of the transportation industry had led to many evils of which the public might justly make complaint. Finding no redress at the hands of railroad managers appeal was made to the sovereign power of the states, resulting in the passage of those laws known as the "Granger Laws," which asserted the right of public control over internal commerce. This brings us to the fourth phase of public sentiment referred to. . . The country at the present time seems to have accepted the idea that the railroad problem is to be solved through the medium of railroad commissions.

I have called your attention to these changes in public sentiment for the purpose of impressing the fact that the control of railroads through commissions is an experiment rather than an established policy. As sentiment has changed in the past, so it may change in the future. The people of this country do not grant their support for any considerable length of time to an idea which fails to justify itself when put on trial, and it may be well for the members of this Convention to hold in mind the fact that unless their work is aggressive in character and decidedly beneficial in result the support of public sentiment will sooner or later be withdrawn. It is therefore pertinent to inquire if every means which the law places at the disposal of railroad commissioners is now being used for the solution of the railroad problem. It is of the utmost importance that a political experiment when once undertaken should be thoroughly tried, in order that, should it prove unsuccessful, it need not be recurred to again in the future. There is no other guaranty that change will be progress.

Without entering into a general discussion of the efficiency of commissions when compared with the powers bestowed by legislatures, I desire to call attention to one instrument of control which the law has placed in their hands, of which adequate use is not made. I refer to the power bestowed on every railroad commission in this country to secure statistical returns. . . . Legislative enactments do not contain any formal definition, but they clearly indicate the nature of the railroad problem. . . . The railroad problem consists in securing to all shippers equality of opportunity in the use of railroad facilities at just and reasonable rates. Our question, therefore, resolves itself into this: How can a bureau of statistics and accounts aid the commissions in establishing and maintaining equality of opportunity and just rates? I shall confine myself to three points: 1, the enforcement of the law against discrimination; 2, the determination of just rates, and 3, the maintenance of stable rates.

Laws which declare certain things illegal are of two sorts—those which rely upon police power to insure compliance, and those which are so adjusted to the prejudices and interests of persons that they are self-executory in character. A law which provides for safety in mines is of the first class; a law which provides for the enforcement of commercial contracts by legal procedure belongs to the second class. One cannot determine from reading the various acts creating railroad commissions to which class of laws these acts belong. Holding in mind the strong commissions, like those of Illinois and Iowa, rather than commissions which are supervisory in character, like those of Michigan and Massachusetts, commissioners may render opinions in cases presented to them, or they may themselves originate cases; they may act as an administrative court, or they may exercise visitorial powers and assume the functions of a prosecutory agency. The character of the laws in this regard is determined by the policy which the commissioners see fit to adopt in their execution.

Now, it is no secret that under present conditions it is exceedingly difficult for the shipper whose rights are invaded by a railroad to secure quick and speedy relief; and on that account shippers conceive their interests to depend upon the good will of railroad managers rather than upon commissions or courts, and consequently refuse to bring their cases, with all the evidence necessary to secure conviction, to the attention of commissioners. Under such circumstances, a sufficient number of cases do not arise spontaneously to enable commissioners to exercise a controlling influence over the administration of railroad affairs, and the result is they feel themselves obliged to undertake the enforcement of the laws by the exercise of visitorial functions, or by the direct instigation of cases. . . . The question then arises, How may the railroad laws of the United States be made self-executory? Under what conditions will shippers appeal to the commissions, bringing their evidence with them rather than suppressing evidence, and using it as a lever to force special favors from railroad managers. The establishment of such conditions is essential, for a law against discrimination cannot be enforced so long as both carriers and shippers are inter-



STANDARD SPRING-RAIL FROG—NORFOLK & WESTERN RAILROAD.

* A paper on "Service of a Bureau of Statistics and Accounts in the Solution of the Railroad Question," read by Prof. Henry C. Adams, Statistician to the Interstate Commerce Commission, before the Convention of Railroad Commissioners, at Washington, April 19.

ested in the law's defeat. I may call your attention to one step. There must be a uniformly organized and uniformly administered railroad system. Managers cannot be allowed the liberty of adopting unusual methods of business, nor attorneys the right of urging before the commission peculiar policies of management as defense for unusual methods. All orders pertaining to transportation must be clear, simple and easily understood. Under these conditions shippers would come to know their rights, and in case their rights were disregarded, they would undertake to secure redress. Now the first step toward uniformity of management is to establish uniformity in accounts and to take from railroad officials the right of adjusting their accounts in an arbitrary manner. Accounts, if they be honest, are true records of administration; and he who controls accounts can, in a large measure, control the policy of management. Should the form of bookkeeping be determined by commissions, and all railroads be obliged to adjust their accounts to uniform rules, the commissioners would be in a position to impose their ideas, in a very large measure, upon the management of the roads. And what is more important, they would be in a position to secure evidence against a carrier guilty of discrimination more easily than at the present time. And more than this, uniformity in accounts and strict supervision over them provides a new way of testing the compliance of the carriers with the rules of the commissioners. Statistics regard to any commodity whatever without having first determined the conditions of production.

The rule that specific railroad rates should be determined by specific cost of service appears to me to be wholly untenable, and the practice of charging "what the traffic will bear," as applied by railroad managers, to be incapable of defense. Provided, however, it be applied in such a manner as to assign total of cost of carrying traffic to the various classes of freight carried, and not to the determination of a rate which will secure the largest aggregate income, I see no reason why it cannot be accepted as a safe rule for commissions to follow.

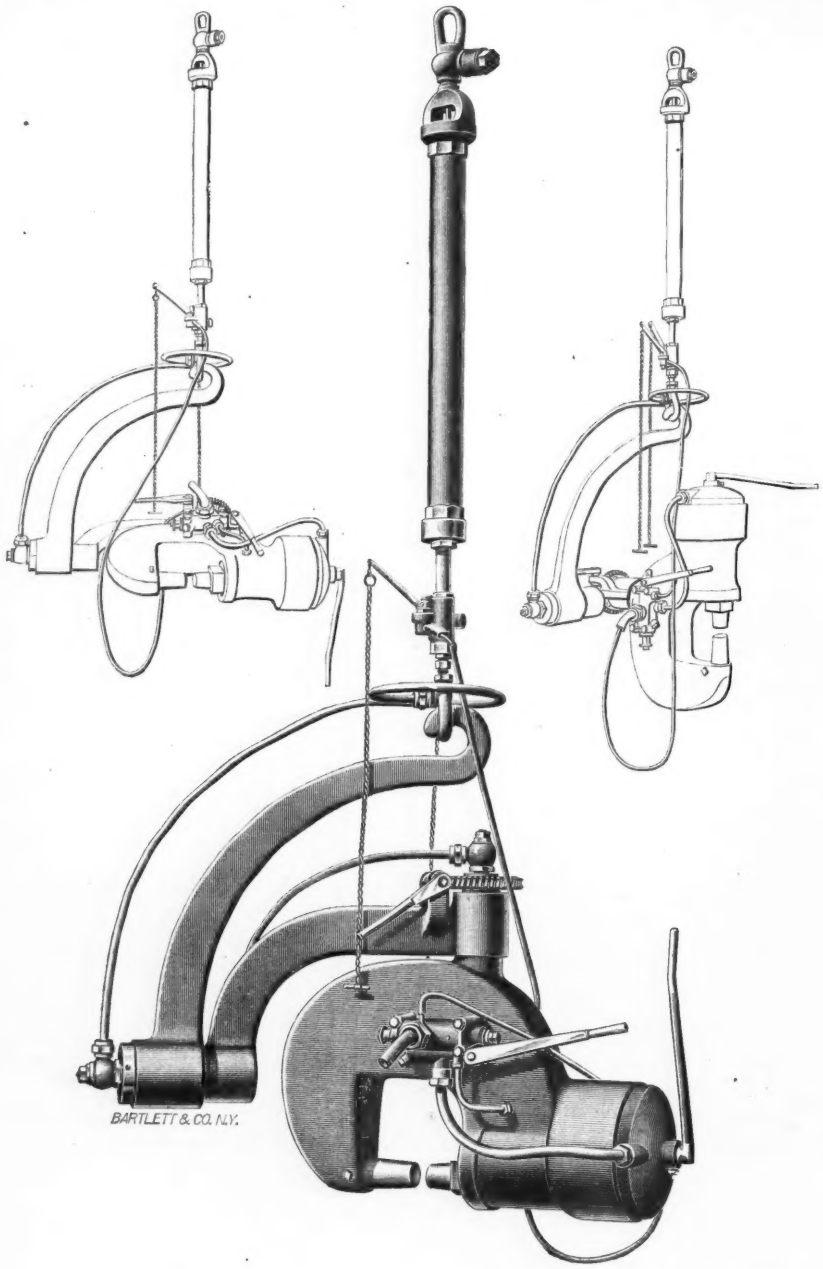
Professor Adams then went on to recommend uniform classification of freight as a necessary feature in his plan for a modified cost-of-service rate and, taking up the subject of stability of rates, said:

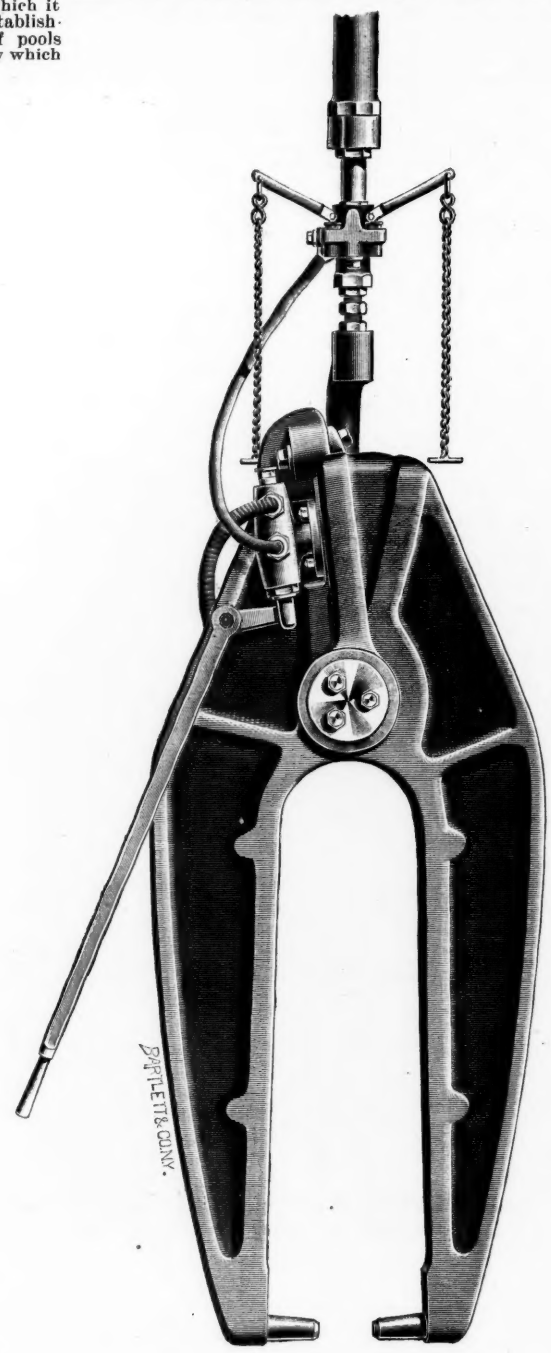
In studying pooling the fact which has been most forcibly impressed upon me is that no traffic agreements could last for any considerable length of time, except under the application of what is technically known as the principle of territorialization. When the Michigan Central is permitted to compete for freight between New York and New Orleans, of what avail would it be for the roads to which that freight naturally belongs to enter into an agreement as to the manner in which it shall be divided? The first step toward the establishment of stable rates through the legalization of pools would be a scientific classification of railroads by which existence between great corporations, or a struggle for special favors at the hand of great corporations, or it has ceased to exist altogether. In this lies the explanation of most of the industrial complications which perplex the nineteenth century. According to the common law of industries, competition is potent; but, in reality, competition is rendered impotent by the arbitrary manner in which railroad managers administer their trusts. If this be true, the railroad problem comes to be a problem of civilization. It is a question of keeping open the avenues of opportunity.

Without doubt the railroad corporations would assert that such a bureau as I refer to would encroach upon the established rights of privacy. But in an industry which touches at every point the life and the prospects of citizens there ought to be no question respecting the right of government to make the fullest and completest investigation.

New Hydraulic Portable Riveting Machines.

Structural iron workers will find some interesting features in the annexed illustrations, showing two of a





HYDRAULIC PORTABLE RIVETING MACHINES.

By the MORGAN ENGINEERING COMPANY, *Alliance, Ohio.*

properly used and adequately guided are the surest means of detecting any general departure from established rules of management, and, if commissions must continue visitorial functions, will indicate where it is worth while to undertake special investigation. Railroad laws are not, at present, self executory because of the difficulty of securing evidence of crimination. And this is due to the complex methods by which railroads do their business.

The Interstate Commerce Commission and 17 state commissions are clothed with the power of adjusting rates. If the commission idea finally breaks down, it will be because commissions are unable to deal with this vexed question. At present they are not in a position to deal with the question, for there is no generally accepted theory respecting the basis of rates, and consequently there can be no uniformity in their decisions. Commissioners are in no position at present to judge clearly with regard to the respective claims of shippers, stockholders, and the public, for they have no facts to work upon at all adequate to the magnitude of the problem. If there be any generally accepted theory, it is that rates should bear some relation to cost of service. But Commissioners are in possession of no information respecting the cost of service that is of the slightest assistance in the application of this theory. It is, however, absurd to speak of determining a just price with each company may know what freight it can legitimately carry. This is doubtless an extension of public authority beyond any which has thus far been contemplated by our laws, but there is no other way of bringing the matter under control so as to adequately guard the public interest. It follows, therefore, that if pooling be forced upon government by the continual wars of railroads, the government must establish and support well-equipped statistical bureaus. It seems, then, whether we consider the question of discrimination, of just and reasonable rates, or of stability in rates, that a bureau designed especially for investigation and for imposing upon the railroads uniform methods of management is essential to the realization of the commission idea. This has not been adequately recognized in the past, and it rests very largely with the members of this convention whether it shall be recognized in the future.

Looking at the matter in the light of history, railroads, as administered, have destroyed the conditions under which the principle of competition can work for the great rank and file of business in a normal and satisfactory manner. In theory, competition is the central principle of our industrial structure. Both legislators and courts assume it to be present in the great majority of cases, and because of their confidence in its potency, they deny the pertinency of socialistic arguments. In fact, however, competition has degenerated into a struggle for

large class of new hydraulic portable riveting machines, brought out by the Morgan Engineering Company, of Alliance, O., with New York offices at 136-138 Liberty street.

Fig. 1 represents a direct-acting portable riveter, well adapted for heavy work, and made with any desired depth of throat, from 12 in. to 6 ft., and sufficiently powerful to close any size rivet up to 1⅛ in. In the illustration a machine with 12-in. throat is shown, capable of exerting a pressure of 150 tons on the rivet. It is suspended from a universal hanger which permits swinging it into any desired position. The small, outline drawings in the upper right and left hand corners show different positions which can be assumed, and the convenience of which scarcely requires pointing out.

The hydraulic pressure goes to the riveter through a telescoping pipe, which, at the same time, serves to raise or lower the machine, the smaller pipe acting as a piston in the larger one. Two valves, operated by levers and chains, as shown, control the raising and lowering. The

frames or bodies of the machines are made of cast steel the valves, cylinder linings and the pressure pipe hoists are of bronze.

Fig. 2 illustrates a lever type port able riveter. The riveting dies in this machine are carried at the ends of arms or levers of any desired length, and the fulcrum is located between them and the applied power. By this arrangement, with the hydraulic power cylin. der at the short ends of the arms, the machine is made to work somewhat after the manner of a pair of shears. The design, it will be seen, affords two comparatively slender cast steel arms which can be made to reach into all sorts of out-of-the-way places, and require but little space for their manipulation. The operator, moreover, can see his work distinctly. The water is supplied to the machine through the joint on which the arms work, and there is thus no obstacle to swinging the machine into any convenient position. As in the case of the machine shown in fig. 1, a universal hanger and pressure pipe hoist are supplied with this machine if desired. Any size rivet up to the heaviest can be driven by the machine, and the reach in the different sizes varies from 2 to 5 ft. For gas-holder tank riveting—one of several uses to which the machine is specially applicable—a mast may be set at the centre of the tank, and by means of a light jib the machine can then be swung around the entire circle, closing every rivet in the sides. For this class of work the machine is generally made with a 5-ft. reach.

Among the several other riveting machines turned out by the Morgan company is also a lever type, port able riveter, suspended from a light jib crane by means of a pressure pipe hoist and a universal hanger, the hoist being attached to a small trolley which travels on the upper flange of the crane jib. The water under pressure in this case is supplied by means of a jointed "walking pipe," with a swing joint at the crane axis. The crane can be conveniently attached to either a wall or post or roof column. The riveter has a 24-in. reach, and can close 1-in. rivets. Still another form of very compact machine, also fitted with a pressure pipe hoist and occupying very little space, has been designed for closing rivets around the doors of fireboxes, foundation rings, flanged joints, riveted heads on boilers, etc A complete outfit of these riveters forms part of the equipment of the new Altoona shops of the Pennsylvania Railroad, where they are used for locomotive boiler work. A variety of applications of the machine will readily suggest themselves, in general structural work, for example, riveting up girders.

For ship work, riveting up frames, etc., several special forms of portable riveters, together with the various appliances for handling them, are made by the company, and the facilities afforded by these enable all the rivets in a ship's frame to be closed by power. Water is supplied to all these machines through flexible copper piping, regularly made for the purpose.

Train Accidents in the United States in March.

COLLISIONS.

REAR.

1st, 5 a. m., on New York, New Haven & Hartford, at Norwood, R. I., the eastbound steamboat passenger train, which had been suddenly stopped by the flagman of a preceding freight, broke in two behind the tender, necessitating a delay to recouple the train. While the train was standing there, with the hind car on the bridge so that the brakeman did not go back promptly, it was run into at the rear by a following express train, damaging the engine and the rear platform of the hind car. An infant nine months old, lying on a seat in one of the cars of the foremost train, was killed. It was not thrown off the seat, but its neck was probably dislocated. Six other passengers were injured. It appears that the second passenger train was following the other too closely. This part of the line has automatic track circuit signals at most of the stations, and the stations are near together, but the signal sections are not continuous and there is none at Norwood.

3d, on Pennsylvania road, near Ardmore, Pa., a freight train descending a grade broke in two, and the rear portion afterward ran into the forward one, wrecking a dozen cars; 1 brakeman was killed. The wreck took fire, but the flames were extinguished by the town fire engines.

3d, on Lehigh & Hudson River, near Buttsville, N. J., the southbound Boston express, consisting of 7 sleeping cars, ran into the rear of a preceding freight which had been stopped by snow. The fireman jumped off and was injured. The caboose and several freight cars were wrecked and the wreck was mostly burned up.

5th, on Great Northern, at Bellingham, Minn., a passenger train standing at the station was run into at the rear by a freight train, wrecking several passenger cars. The wreck took fire and was mostly burned up. One passenger was killed.

6th, on New York Central & Hudson River, at Tivoli, N. Y., the Empire State express train ran into a work train, wrecking the caboose and 1 platform car, killing 1 trainman. It is said that the passenger train ran past a semaphore signal which was against it.

6th, on Jacksonville, Tampa & Key West, near Palatka, Fla., a freight train ran into the rear of a passenger train. One passenger was injured.

13th, night, on New York, Ontario & Western, near Valley Mills, N. Y., a freight train ascending a grade broke in two and the rear cars ran back into the head of a following freight train, making a bad wreck. There were several cars of oil in both trains and there was a great fire. Three trainmen were killed. The train that broke was about to stop for water, and it is alleged that the brakemen on the rear part had got off and entered a saloon.

16th, 5 a. m., on New York, Lake Erie & Western, at Lackawaxen, Pa., eastbound passenger train No. 12, standing at the station, where it had been slightly delayed, was run into at the rear by train No. 10, completely demolishing one sleeping car and injuring 10 passengers, 3 of them probably fatally. Fire broke out in the wreck, but it was soon put out.

19th, on Pittsburgh, Fort Wayne & Chicago, near New Galilee, Pa., a freight train broke apart and the rear portion afterward ran into the forward one, throwing several cars upon the opposite main track. The engineman jumped off, but was instantly killed by a car falling upon him. A west-bound freight train ran into the wreck.

22d, on Pittsburgh & Western, at Kent, O., a freight train ran into the rear of a preceding freight, wrecking the engine and 5 cars. The engine fell down a bank, and the caboose and 1 car were burned up. It is said that the flagman did not go back far enough.

24th, 4 a. m., on Wilmington & Weldon, at Fayetteville, N. C., a passenger train ran into a freight car, badly damaging the engine; engineer and fireman scalded.

25th, 3 a. m., on Pennsylvania road, at Lawrence, N. J., a southbound passenger train which had been stopped at a block signal station was run into at the rear by a following passenger train, badly damaging the engine and several cars. Several passengers and one baggagemaster were slightly injured. There was a dense fog at the time.

28th, on Chicago & Northwestern, in Chicago, a passenger train ran into the rear of a preceding passenger train, doing considerable damage. The wreck took fire, but the flames were quickly extinguished. Three passengers were injured, one of them fatally.

29th, on Lehigh Valley, at Cheektowaga, N. Y., an empty engine ran into a work train, doing considerable damage. Three employés were injured.

30th, on Richmond & Danville, at Waco, Ga., a freight train ran into the rear of a preceding freight. The engine was overturned and the engineer and fireman killed.

30th, on Chicago & Northwestern, at Moingona, Ia., a freight train ran into the rear of a preceding freight, damaging the engine and caboose and slightly injuring several passengers in a sleeping car attached to the foremost train. These passengers were from the Island of Java, accompanying the exhibit of that country to the World's Fair.

And 19 others on 16 roads, involving 4 passenger and 28 freight and other trains.

BUTTING.

4th, on Pittsburgh, Cincinnati, Chicago & St. Louis near Richmond, Ind., butting collision between a freight and a work train, making a bad wreck. Four trainmen were injured.

6th, on Columbus, Hocking Valley & Toledo, near Howell, O., butting collision of freight trains, one of which was drawn by two engines, making a very bad wreck. One engineer was injured. It is said that conflicting telegraphic orders had been given.

7th, on Philadelphia, Reading & New England, near Clintondale, N. Y., butting collision between a passenger train and a freight, wrecking 3 cars, and injuring 4 trainmen.

9th, on Pittsburgh, Cincinnati, Chicago & St. Louis, at Union City, Ind., a passenger train which had just passed a switch, with the intention of backing into the side track to meet a freight, collided with that freight train, wrecking both engines, one mail car and a dozen freight cars. One fireman and 11 passengers were injured.

16th, on Toledo & Ohio Central, near Moxahala, O., butting collision between an empty engine and a passenger train, wrecking both engines and several cars. One fireman was killed, conductor and express messenger injured.

16th, on Philadelphia, Reading & New England, near Simsbury, Conn., butting collision of freight trains; engineer injured. It is said that the eastbound train ran past an appointed meeting station.

18th, on Pennsylvania road, near Barre, Pa., butting collision of freight trains, wrecking 3 locomotives and 30 cars, mostly loaded. It is said that a block signal operator gave a clear signal wrongfully. A fireman was slightly injured. A trackman and another man were killed by moving cars soon after the collision.

22d, on Atlantic & Pacific, at Exeter, Ariz., collision between a passenger train and a freight; 1 engineer and 1 fireman killed.

30th, on Burlington & Missouri River, at Germantown, Neb., an eastbound passenger train ran over a misplaced switch and into the head of a westbound passenger train standing on the side track. Both engines and 2 cars were badly damaged, and a fireman and mail agent injured.

And 4 others on 4 roads, involving 3 passenger and 5 freight and other trains.

CROSSING AND MISCELLANEOUS.

5th, 3 a. m., on Pittsburgh, Cincinnati, Chicago & St. Louis, at Cincinnati, O., a collision of yard engines resulted in the fatal injury of 3 trainmen.

9th, at Chadd's Ford, Pa., a passenger train of the Philadelphia, Wilmington & Baltimore ran into a freight train of the Wilmington & Northern at the crossing of the two roads. Several freight cars were wrecked, the passenger train derailed and its engine thrown down a bank. The passenger engineer was killed and the conductor injured. One passenger was also injured.

9th, at Tolono, Ill., a freight train of the Wabash road ran into a freight of the Illinois Central at the crossing of the two roads, throwing several cars against the station building. There was a dense fog at the time.

13th, on St. Paul & Duluth, at Duluth, Minn., collision of switching engines; 6 employés injured, one of them fatally.

16th, on Lehigh Valley road, near Delano, Pa., a Lehigh Valley freight train ran over a misplaced switch and into a Pennsylvania locomotive standing on the side track, making a bad wreck. Three trainmen were injured.

21st, at 39th street, Chicago, a passenger train of the Chicago, Rock Island & Pacific ran into a passenger train of the Lake Shore & Michigan Southern, doing considerable damage to the engines and injuring 1 fireman. It is said that the Rock Island train disregarded a signal and ran over a misplaced switch.

23d, on Chicago, Milwaukee and St. Paul, at Watertown, Wis., a passenger train ran into a switching engine, wrecking both engines and 1 one baggage car. One fireman was injured.

28th, on Philadelphia & Reading, in Philadelphia, collision between a runaway car, which had been let loose by mischievous boys, and a switching engine. The engineer was injured.

29th, on Southern California, at Orange, Cal., collision between a passenger train and freight train, due to a misplaced switch; 3 passengers injured.

31st, on Illinois Central, at 70th Street, Chicago, a north bound passenger train of the Illinois Central ran into the caboose of a Michigan Central freight which was running through a crossover, wrecking the caboose and injuring 2 trainmen.

And 14 others, on 13 roads, involving 1 passenger train and 25 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

1st, on Lehigh Valley, near Morea, Pa., a freight train was derailed at a point where the roadbed had been weakened by the caving in of a coal mine beneath it.

1st, 7 A. M., on St. Louis, Iron Mountain & Southern, near Hope, Ark., passenger train No. 52 was derailed, it is said, by a loose rail, and the cars fell down a bank. The sleeping car and 3 passenger cars caught fire and were burned up. Twenty-two passengers and 1 trainman were injured.

8th, on Southern Pacific, near Beaumont, Cal., 3 cars of a passenger train were derailed at a culvert which had been weakened by a sudden rain. The mail car was overturned and fell down a bank. A tramp stealing a ride was injured.

13th, on Baltimore & Ohio, at Jessups, Md., a passenger train was derailed by a broken frog and two passengers injured.

14th, on Central of Georgia, near Bolingbroke, Ga., a passenger train running at high speed was derailed and most of the cars ditched. One passenger car ran against the engine and it was filled with steam from a broken pipe but the passengers all got out quickly. Two trainmen and six passengers were injured. It is said that the rails spread.

17th, on Buffalo, Rochester & Pittsburgh, near Ridgway, Pa., a freight train was derailed by a spreading of rails, and the engine and 6 cars fell into the Clarion River. The engineer was fatally injured.

20th, on Philadelphia & Reading, near Pottstown, Pa., the engine of a freight train was derailed by a broken rail and fell down a bank. The engineer and fireman were injured.

23d, on Columbus, Hocking Valley & Toledo, at Alvada, O., a freight train was derailed by spreading of rails, and 16 cars wrecked. One brakeman was killed.

24th, on Flint & Pere Marquette, near Genesee, Mich., several cars of a mixed train were derailed at a defective culvert. Several passengers were injured.

27th, on Mokawk & Malone, near Herkimer, N. Y., engine and baggage car of a passenger train derailed and overturned at a point where the roadbed had been weakened by a thaw. The engineer was injured.

31st, on Georgia road, near Jug Tavern, Ga., a mixed train fell through a trestle, 6 freight and 2 passenger cars falling 50 ft. and being completely wrecked. One trainman was fatally injured and 4 others and 3 passengers less severely hurt.

31st, on Denver & Rio Grande, near Leadville, Col., a passenger train was derailed by spreading rails, and 4 sleeping cars overturned. Eighteen passengers were injured.

And 11 others on 11 roads, involving 4 passenger and 7 freight and other trains.

DEFECTS OF EQUIPMENT.

10th, on Florida Central & Peninsular, near River Junction, Fla., a freight train was derailed by the breaking of a flange and 3 cars were wrecked. One brakeman was injured.

28th, 1 a. m., on Philadelphia & Reading, at Linfield, Pa., two cars in a passenger train were derailed by a loose wheel under one of them. Several passengers were slightly injured.

And 9 others on 8 roads, involving 2 passenger and 7 freight and other trains.

NEGLIGENCE IN OPERATING.

14th, on Louisville & Nashville, near Pulaski, Tenn., a freight train was derailed by running over a hand car; fireman scalded.

17th, on Union Pacific, near Evanstown, Wy., a passenger train, running at high speed, was derailed at a misplaced switch, making a bad wreck; engineer and postal clerk injured, the latter fatally.

26th, on Cincinnati, New Orleans & Texas Pacific, at Somerset, Ky., a yard engine and caboose, the caboose in front, were derailed at a misplaced switch. Brakeman killed and two other trainmen injured. The train was being run at reckless speed.

27th, on Illinois Central, at Kensington, Ill. a postal car on the rear of a passenger train was derailed at a switch, which was thrown while the car was passing over it and was thrown over against a passenger train running in the opposite direction, badly damaging the car. A mail agent was injured.

29th, on Long Island road, in Brooklyn, N. Y., a passenger train being run into the station after the engine had been detached ran against the buffer blocks at considerable speed, doing some damage. One passenger was injured and several others badly shaken.

And 9 others on 9 roads, involving 2 passenger and 7 freight and other trains.

UNFORESEEN OBSTRUCTIONS.

9th, on Philadelphia & Reading, near Bingen, Pa., a passenger train was derailed by a landslide, wrecking the engine and badly damaging the first 4 cars. The engineer was killed and the fireman injured. The slide was in a deep cut, and it is said that a trackwalker inspected the road at that point only five minutes before.

22d, on Grand Rapids & Indiana, near Winchester, Ind., a freight train was derailed at a point where the rails had been maliciously loosened, and several cars ditched. Two trainmen were injured. It is supposed that the rails had been loosened with the intention of wrecking a passenger train, but the passenger train went over the track in safety.

22d, night, on Toledo, Ann Arbor & North Michigan, near Owosso, Mich., passenger train No. 5 was derailed at a misplaced switch. The switch light had been stolen and the misplacement of the switch is attributed to friends of the striking engineers.

23d, on Louisville, Evansville & St. Louis, near Huntingburg, Ind., a passenger train ran into a tree which had blown across the track and was badly wrecked. A brakeman was fatally injured and 3 passengers badly hurt.

25th, on Southern Pacific, at Twenty-seventh street, San Francisco, a freight train was derailed and the engine overturned. Several cars were wrecked. It is said that a switch had been maliciously misplaced. An engine which came up behind to draw back the cars which were not derailed, soon after, while running back, collided with a passenger train, and both engines and the baggage car were badly damaged. The passenger engineer was injured. There was a dense fog at the time, and it appears that the wrecking engine was running on the time of the passenger without authority.

And 9 others on 9 roads, involving 3 passenger and 6 freight and other trains.

UNEXPLAINED.

1st, on New York, Lake Erie & Western, at Warren

Point, N. J., a freight train was derailed and 17 cars wrecked. One brakeman was injured.

3rd, on Atchison, Topeka & Santa Fe, near Olpe, Kan., a car in a passenger train was derailed, and 4 passengers injured.

4th, on Chicago & Northwestern, near Baraboo, Wis., a car in a passenger train was derailed and ran against a freight train standing on a side track, badly damaging the passenger car and several freight cars. One passenger was killed and 3 injured.

5th, on Columbia & Port Deposit, at Port Deposit, Md., the engine of a freight train was derailed at a point where the water was a foot deep over the track, a flood prevailing at the time.

6th, on Richmond & Danville, near Winnsborough, S. C., a special train carrying soldiers was derailed and 1 passenger injured.

6th, on Chicago & Erie, near Lima, O., a car in a freight train was derailed near a bridge and was dragged upon the bridge, which gave way, precipitating 19 cars into the stream, 30 ft. below.

9th, on Delaware, Lansing & Northern, near South Lyon, Mich., a passenger train running at considerable speed was derailed and the engine and 2 cars ditched; engineer and 1 passenger injured.

11th, on Chicago, Milwaukee & St. Paul, at Otranto, Ia., a freight train was derailed and several cars wrecked. The engineer was killed.

14th, on Baltimore & Ohio, near Tiffin, O., a car in a freight train was derailed and ran nearly two miles on the sleepers, cutting off a great many track bolts.

19th, 5 a.m., on Long Island road, at Long Island City, N. Y., a freight train was derailed and the cars ran against a signal tower. Two brakemen were killed.

22d, 3 a. m., on New York Central & Hudson River, near Tribe's Hill, N. Y., a car in a freight train jumped the track and one of the trucks broke loose and was lodged on the adjoining passenger track. It appears that this derailment was unknown to the trainmen, as the rear portion of the train had previously broken off, and the derailed car was at the hind end of the forward part of the train, which was proceeding on its way, the engineman being unaware of the break-in-two. The fast mail train soon came along, and while pulling the derailed truck onto a side track pushed two of its own cars off the track at a frog.

23d, on Great Northern, near Fargo, N. D., a sleeping car in a passenger train was derailed and fell down a bank. Three passengers were injured.

27th, on Central of Georgia, near Five Points, Ala., the engine and 8 cars of a work train were derailed and 2 trainmen injured.

And 27 others on 21 roads, involving 2 passenger and 25 freight and other trains.

OTHER ACCIDENTS.

3d, on Lehigh Valley, at McKune's, Pa., a locomotive of a freight train was wrecked by the explosion of its boiler. Two employés were killed and 2 injured.

5th, on Western Maryland, at East Hagerstown, Md., the locomotive of a freight train was wrecked by the explosion of its boiler, injuring 3 employés, 2 of them fatally.

11th, on Delaware, Lackawanna & Western, near Moscow, Pa., the engine of a passenger train was damaged by the breaking of a parallel rod, the boiler being ruptured. The escaping steam forced the three men in the cab to jump off, and they were badly injured.

13th, on Philadelphia, Reading & New England, at St. Elmo, N. Y., the engine of a freight train was wrecked by the explosion of its boiler and 3 employés killed.

15th, on New York, New Haven & Hartford, at Olneyville, R. I., the caboose of a freight train which was being pushed by a passenger engine (also pulling its own train) was derailed in consequence of the sudden application of the brakes on the freight engine. The caboose seems to have been lifted by the pilot of the passenger engine, and three freight cars were also derailed.

18th, 4 a. m., on Montana Union, near Butte, Mont., the engine of a freight train was wrecked by the explosion of its boiler. Two trainmen were killed and 2 others injured, one fatally.

30th, on Southern Pacific, near Stockton, Cal., a passenger car in a mixed train was badly damaged by some long wrought-iron pipes which fell off a platform car while the train was running at 30 miles an hour. Some of the pipes in falling struck the ground first at the front end and were driven through the passenger car. Two passengers were injured. The whole train was equipped with air brakes and it was stopped very quickly by the conductor, thus mitigating the damage.

And 5 others on 5 roads, involving 4 passenger trains and 1 freight.

A summary will be found on another page.

Operating Results of Cable Railroads.

At the regular meeting of the American Society of Civil Engineers, held Wednesday evening, April 19, Mr. D. C. Bontecou presented a paper on the cost of operation of cable railroads. An abstract of this paper and of the discussion which was had follows. Mr. Bontecou states that the information furnished by the officers of cable railroads has not been proportionate to the importance of the subject, and much of it is misleading. He has endeavored to present some facts from his own observations and experience which will help to arrive at definite and correct conclusions.

The author says that the cost of operation for a fast and frequent service is less with the cable than with any other form of traction; and the cost of first-class construction is so large that a suitable amount of business is needed to make a cable road profitable. The amount of gross receipts necessary to justify the expenditure of a given amount in building a road is not well understood; and the writer presents the facts as to cost of operation of a single system in Kansas City, during the last fiscal year, as representing the inferior limit of justifiable cable operation, the net earnings having been about 3½ per cent. on its cost, and the average number of passengers transported daily per mile of double track 1,706. There are 8.54 miles of double track disposed as a trunk line in the business part of the city, with three diverging feeders; and the system is operated as three distinct lines with one common terminus; about two-thirds of the territory which is served is sparsely built up. There are three driving ropes, respectively 14,200, 29,500 and 31,000 ft. long. The power-house is at the junction of two of the lines, and a fourth rope, 9,200 ft. long, is driven from a separate house. The speed of the cars is 7.8, 9.85 and 10.25 miles per hour. There are 716 deg. of double track curvature, with no grades exceeding 10 per cent. The rope is 1¼ ins. in diameter and is carried on 12-in. pulleys in a conduit 36 ins. deep. The combination cars each seat 40 persons, run on two four-wheel trucks with 22-in. wheels and have side-bearing grips. The plant at the main power-house consists of one 36 × 48-in. and one 32 × 48-in. simple non-condensing engine, which are run alternately by three 200-H. P. boilers. Driving drums are 12 and 14 ft. in diameter. In the branch power-house there is a 24 × 48-in. simple engine and two 175-H. P. boilers. The equipment comprises 99 combination cars, and the system has been in operation four years.

The total cost of the plant as given in detail is $1,905,989, and, exclusive of the cost of franchise and grading new streets, the cost is $223,184 per mile.

The total cost of operation, including injuries to persons and property, secret service, general miscellaneous expenses and taxes and all other items of expense, was $195,241.

The total car mileage was	2,830,732
The number of passengers carried	5,318,410
The number of passengers per car-mile	1.9
Average number of cars run daily	61

This shows a net cost of 6.9 cents per car-mile, or, if interest at 5 per cent. be added, 11.02 cents. A larger amount of business would possibly increase the cost per car-mile ¼ cent.

The fuel used is bituminous Kansas coal, with about 18 per cent. ash. It consists of nut and slack coal mixed in the proportion of 3 to 2, and costs $2 01¼ per ton of 2,000 lbs. The writer estimates 2.1 lbs. of coal used per ton-mile, and an average of about 575 H. P. as developed by the two engines.

The total indicated engine friction is 64 H. P., and the total resistance of all the ropes when no cars are on the line is 260 H. P., so that the actual traction of the 61 cars with their load, aside from the friction of the rope and the engine, is about 4.01 H. P. per car. The net result of $\frac{39}{100}$ cents per car-mile for all engine and fuel expense is given. Under more favorable conditions a better showing is made by a number of roads. One line in the East reports last year 2.28 lbs. of coal used per car-mile, the average load being 4⅜ passengers.

The cost of ropes, with the expense of grip repairs, on the Kansas City road is 1.21 cents per car-mile. On the short main line a rope lasts six months, and on the independent branch line two years, the approximate life for the ropes being 20,000, 55,000, 68,000, and 130,000 miles. The cables are bought on a guarantee and the cost charged out each month. These lines could be built to-day for less money than they cost five years ago.

The cost of a line in the East, built on a perfectly straight line for very heavy traffic, with a design to secure permanence and small operating expense, having 33,000 ft. of rope driven by compound condensing engines of 300 H. P. each, is given at $239,240 per mile.

In the *Census Bulletin*, the cost of 10 cable roads is given at prices varying from $160,000 to $684,000 per mile, or an average of $350,000 per mile. But such statistics are misleading; the more usual range of cost should be from $150,000 to $250,000 per mile, with a service not materially less than 1,000 car-miles daily per mile of double track. These figures seem to indicate additional expenses per car-mile of from 2¼ to 4½ cents. To reach conclusions as to the cost of a system, it is proper to consider only such as have been built without entanglement with construction companies or incompetent engineering, and have been run with a reasonable amount of skill and economy. In this, as in all other matters of construction, skillful designing has much to do with success.

In discussion Mr. E. P. North read a table of comparisons of some 15 surface roads in New York and vicinity, showing the total cost of caring for, feeding, shoeing, etc., 12,553 horses to be $2,715,215.25, the annual cost per horse being $216.30, the average cost per passenger being 1.63 cents.

Mr. T. C. Clarke stated that the difference in cost of operation, exclusive of fixed charges on capital, between horse and cable roads is not so great as would be imagined; the cost of motive power being only about one-half the total expenditure of running the line, the economy of cable over horse roads is confined to one-half the expenditure. But the important point is the enormous increase of running capacity in cable or electric lines over the horse railroad, in consequence of the high rate of speed which the former can attain as soon as they get out into the country. A greater number of cars can be run and a much greater number of passengers carried.

Mr. C. B. Brush stated that for some ten years an elevated road has been running in Hoboken from the ferry to the top of the hill overlooking a level of about 100 ft.; this road was operated by cable. The road is a feeder of a large number of horse-car lines that unite at the top of the hill. During the past year this elevated road has been extended, and the extension, for about six months, was operated with electricity. This portion of the road operated by electricity proved so successful that the main track was equipped with the electric system, and, except during commission hours when the cable system was maintained, the whole road was for some time operated with electricity; that this system has proved so convenient and so successful that the cable has been now abandoned and the electric system only retained. The economy of operation is quite marked over that of the operation of the cable. While the cable was in operation, the life of the cable ranged from nine to fourteen months, the average life of the cables being twelve months.

Dale's M. C. B. Car Coupler.

Additions to the long list of automatic car couplers continue to be made, and every week or two one of new design is put on the market. The engravings show one of the more recent ones, patented by Mr. C. H. Dale, of 15 Warren street, New York. The contour lines of the coupler head are those adopted by the Master Car Builders' Association, and the coupler throughout corresponds to the M. C. B. specifications. The knuckle swivels on a pin which passes through the coupler head vertically, the usual method of attachment.

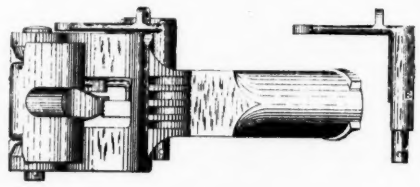


Fig. 1.

The locking device will be clearly understood by referring to figs. 3 and 4. The lock *C* is rotated by means of the shaft *B*, located in the guard arm. The shaft *B* has an arm, *A*, which, with the coupler in the usual position on the car, is above the coupler head and stands at an angle of about 45 degs. with the centre line of the coupler. The lock is freed from the knuckle by turning this arm toward the end of the car. Owing to the shape of the seat of the lock, when the shaft *B* is rotated the lock has a vertical as well as a rotative motion, so that it falls back to the locking position by gravity. Supported by means of a lug on the inside of the top plate of the coupler is a rod, *D*, one end of which is secured to the knuckle and the other engages with the lock when the lock is turned to the unlocking position and the knuckle has been freed, and throws the knuckle open to the position shown by the dotted lines in fig. 4.

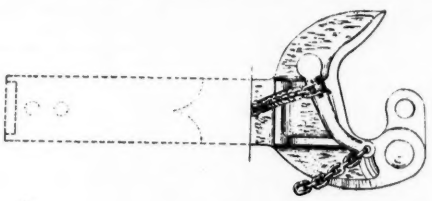


Fig. 2.

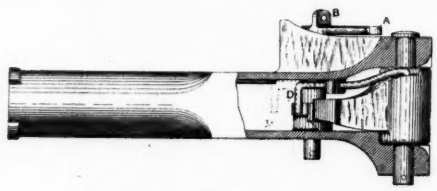


Fig. 3.

Referring to fig. 2 it will be seen that there are two chains connected with the locking device, one of which is connected with the arm *A* for operating the lock ordinarily, and the other connected to the end of the shaft *B* and the deadwood. This latter chain limits the distance the coupler may be pulled out. If the coupler is pulled out farther than the chain allows, the shaft *B* is raised by the chain and the knuckle is unlocked and so uncoupled. At *E*, in fig. 4, is a lug on the sideplate of the coupler head with which the knuckle engages when two are coupled together, and by means of this the pin through the knuckle and head is relieved of a part of the pulling strains. The side view of the coupler is shown in fig. 1.

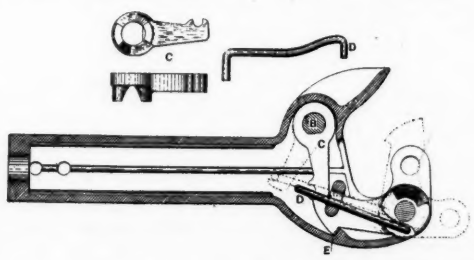


Fig. 4.

There is no slot near the extreme end of the shank for the continuous drawbar attachment, but two boltholes are cored out near the end, through which a yoke may be bolted. The shank is designed for a tailbolt.

Foreign Permanent Way.

The following table gives some particulars of the heavier rails recently adopted on several foreign roads. All are flat-footed rails except those on the London & Northwestern (England), which are bull-headed.

Railroads.	Dimensions and weights of rails.							Ties.			Weight of single track complete per mile.	Do. No. parts per mile.
	A. Height of rail.	B. Width of flange.	Width of head.	Thickness of web.	Proportion of B to A.	Weight per yard.	Length of rail.	No. per rail.	Av. dist. bet. ties	No. per mile.		
	In.	In.	In.	In.	Per cent.	Lbs.	Ft.		In.		Tons.	
Austrian State, 1891.....	5.34	4.71	2.36	0.71	88.3	86½	32¾ 45¼	13 19	30.2 31.0	2,100 2,044		
Prussian State, 1885.....	5.26	4.12	2.28	0.43	78 4	67	29½	10	35.4	1,799		
Prussian State, 1891.....	5.42	4.32	2.83	0.55	79.7	90	29½	11	32.1	1,974		
St. Gothard.....	5.69	5.11	2.75	0.57	89.7	93½	39½	15 16	31.4 29.5	2,018		
St. Gothard (in tunnels).	5.77	5.11	2.75	0.57	88.4							
Paris-Lyon-M'dit'rr'ne'n	5.58	5.11	2.59	0.55	91.6	94½	39½	15 16	31.4 29.5	2,018		
Philadelphia & Reading.	4 99	4.99	2.87	0.67	100	90						
New South Wales†.....	4.90	5.00	2.50	0.81	1.02	80	30	12	36.0	2,112	415.6	13,728
London & N'rthwest'rn*	.....	.....	.....	.....	.....	84	30	10	36.0	1,760	385.3	26 752

* Bull-headed rail on 45 lb. cast iron chairs, secured by two 20-oz. spikes and two 20-oz. screws in each chair. Ties creosoted Baltic pine, 9 ft. by 10 in. by 5 in. deep, weighing 160 lbs each.

† Ties of very hard colonial timber (grey ironbark), 9 ft. by 10 in. by 5 in., weighing 252 lbs. each. Rail secured by one 14½-oz. spike and one 14¼-oz. screw at each tie.

A Bridge with Concrete Piers.

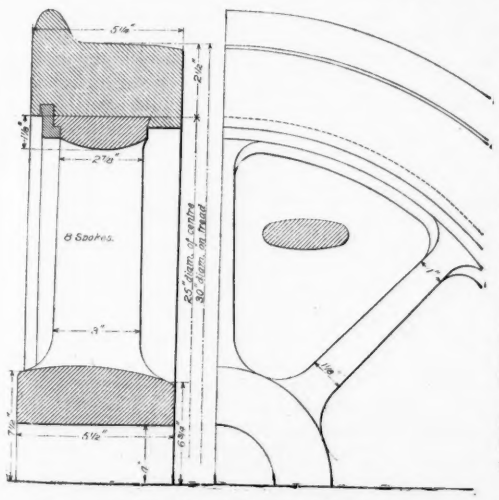
The Red River Bridge of the Chicago, Rock Island & Pacific consists of five spans single track, each 200 ft. long, carried on concrete piers. These piers are 50 ft. high from rock bottom to bridge seat. Open cribs were sunk to rock by pumping out the sand and gravel which had been previously loosened by a water jet, the cribs being weighted. When in position the cribs were filled with concrete. The neat part of the pier was built in side of a curbing or form of 2-in. plank which was afterwards taken down and the pier plastered with a mortar of equal parts of Portland cement and white sand. The concrete was made one part Louisville cement, two sand and four stone, broken to pass through a 2½-in. ring. The cement was tested to 50 lbs. per square inch when mixed pure, exposed in air 30 minutes and in water 12 hours. The concrete in the neat work was 400 lbs. German Portland cement, 10 cu. ft. of sand and 1 cu. yd. of stone. This was tested to 120 lbs. per square inch when mixed pure and exposed one hour in the air and 24 hours in the water.

The cribs were 31 ft. 10 in. × 13 ft. 4 in. inside, and these, as we have said, are filled with concrete. The piers are 11 ft. 4 in. × 29 ft. 10 in. at the base and 8 ft 2 in. × 26 ft. 8 in. over the coping, with semi-circular ends. The river is fordable nearly all the time, and sometimes almost dry, but it is occasionally from 20 to 25 ft. deep in the channel, and spreads over nearly two miles of bottom. There is no ice at any time.

The concrete work was done by McGee & Kahmann, of Kansas City, and the superstructure by the Edgemoor Bridge Works. The total cost was $125,000. Work was begun in May and finished in October, 1892.

Brunswick Wrought Iron, Steel-Tired Wheel.

The illustration shows the Brunswick wrought iron, steel-tired wheel which is manufactured by Page, Newell & Company, of Boston, Mass. The design shown is for a 30-in. wheel made especially for elevated railroad service. As is clearly shown, the tire is fastened by



Brunswick, Steel-Tired Wheel.

means of a retaining ring; the company has several other methods of holding the tire in place, but this is the one especially recommended for use on the elevated roads. The hub is 6¾ in. in diameter on the outside and 7⅛ in. on the inside, and 5½ in. thick, with a 4-in. axle bore. There are eight spokes, elliptical in section, 3 in. by 1⅜ in. at the hub and tapering to 2⅛ in. by 1 in. at the rim. These wheels are all hand forged, the spokes, rim and hub being forged separate and then welded together.

The Ethics of Engineering.

In the last two issues of the *Railroad Gazette* there appeared several papers and addresses delivered before the Boston Society of Civil Engineers at their meeting of March 15, concerning the relations of engineers to each other and to society at large. We have received two other papers which were presented at the same meeting, extracts from which follow.

M. M. TIDD—THE ENGINEER AS AN EXPERT WITNESS.

One of the most delicate and disagreeable duties that an engineer is called upon to perform is that of an expert witness. He is employed by one side of the case, and is expected to testify in such a manner as to give the greatest benefit to the case of his client, while the experts on the other side are expected to do the same for their side of the case. Thus we have the spectacle of two sets of engineers of equal standing and ability testifying in the same case, each endeavoring to controvert the testimony of the other. Should either not succeed in doing so his client complains, and in many cases objects to the bill. The natural result of such a condition is to bring the profession into disrepute.

Some of the testimony in cases that have come under my observation has been enough to bring contempt upon even a lawyer's profession. I have in mind a case which may serve as an illustration. It was a case where a suit was brought by the owners of a mill against a town which had supplied itself with water taken from one of the sources of the stream from which the mill obtained its power, or at least a portion of it. As the water power was unreliable the mill was supplied with steam power enough to run it entirely, and at the time of the trial of the case it was doing so.

It was proposed by the defendant to make restitution by a sum of money which would replace by steam the power lost by the diversion of the water. The plaintiff claimed that a complete plant to furnish that amount (about 7 H. P.), an engine, boiler, power-house and the salary of a man to run it should be paid for. The defendant demurred and claimed that it should simply pay for the coal used in the present plant to give the 7 H. P. required. The plaintiff on oath declared that his engine was taxed to its utmost capacity to run the mill, and that it was impossible to get another horse power out of it. At this point the court adjourned for two days and the experts for the defendant never having seen a mill run up to its utmost limit, having the curiosity to see it, visited the mill next day. There was one main shaft running the entire length of the building, at one end of which was permanently connected three 30-H. P. turbine wheels, standing in about 8 ft. of dead water, while at the other was connected a steam engine running very finely, driving the entire mill and the three turbines. This was certainly a rich find for the experts. Upon interviewing the engineer the following dialogue took place: You have a good engine there? Yes, first class. Runs the mill very easily? Oh yes. How much more power could you get out of it if necessary? Oh, well, 10 to 15 H. P. Do you always carry the three water wheels when you run the mill? Yes, there is no means of disconnectiag them. How much power do you suppose you are wasting on them? Well, probably 50 or 60 H. P. Now this was the steam plant which the plaintiff testified could not turn out another H. P. It is needless to say that this engineer was invited to testify at the next session of the court, which he did honestly.

I merely quote this as one instance of the many that have come under my observation where such reckless testimony is indulged in. Such testimony is certainly no credit to our profession.

There is another disagreeable point in this portion of an engineer's profession in that he is often called upon to testify before a stupid jury or a commission, members of which are equally stupid. I remember testifying in a case before a commission of three lawyers. The hearing was continued for 22 days. There were seven engineers in the case and each one was required to give a statement of what constituted a nominal horse power, which each one did very clearly and carefully, all agreeing in every detail. You can perhaps imagine our disgust when on the opening of the twenty-second day's session one of the commissioners stated that he had used his best ability during the hearing to comprehend the merits of the case, but so far he was totally unable to understand what a horse power was.

It seems to me that an engineer should have a clear understanding with his client as to the merits of the case, and as to what he is expected to testify to before he agrees to enter the case. He should not regard a case entirely from the standpoint of how much money he is to get out of it. He cannot afford to sell his reputation at any price. I remember a case where I was asked to testify, but upon investigating it I was satisfied that the party had no case, and distinctly so informed the counsel, who replied that that was his business, and he could not understand why I would not enter the case if he was willing to pay me for it. I could only reply that I could not take his client's money unless I could render him a service equivalent to it. In this case my answer to the first question would be fatal to his case, therefore, I could not testify for any price.

There is another difficulty in this portion of an engineer's business that is exceedingly disagreeable, which is the uncertainty as to when he will be called upon to testify. He gets his figures all ready, and after much study gets the case clearly in his head and is notified that he will be called upon the stand to-morrow morning; he makes all his arrangements accordingly. When he appears at the hearing he is informed that the case is postponed for a month. When that time arrives he has forgotten his testimony and must read up anew.

I think the whole manner of doing that business is wrong. The experts should be called by the court and the expense assessed, as in the case of any other "costs." In that case the expert would feel under no obligation to either party and would have no client but the court.

HENRY MANLEY—THE ENGINEER, THE MINISTER, THE LAWYER AND THE DOCTOR.

The work of the lawyer concerns questions which grow out of the relations between man and his fellow man. The minister deals with questions which arise between man and God, and the doctor with the relations of man to his own mechanical system. I claim that the engineer is a man who administers the laws of physical nature for the benefit of mankind.

The engineer deals with the laws of God as shown in the physical universe. Of these laws mankind has learned a few, and only a few of the simpler ones. The engineer is certain that a natural law once known is always known; that he can depend upon it under all circumstances; that it is never repealed or suspended, and that a violation of it, whether willfully or ignorantly made, is instantly and inevitably followed by the proper penalty. As a natural consequence he has a most profound respect for it. While human law is proverbially uncertain, the practice of medicine so filled with uncertainty as to be the prey of hordes of quacks and "patent medicine" cranks, and the subject matter of which the minister discourses admits of the widest differences of opinion and practice, the simple laws of nature which the engineer administers are universally accepted and respected, and are neither doubted nor scoffed at. In the light of the laws constantly before him the engineer is, first of all, an honest man. Dishonest men may perhaps succeed in other professions, but I do not see how an engineer who is not honest and trustworthy can be successful.

If the status of the engineer as a professional man is judged by the mental labor required to fit him for his duties he may safely challenge comparison with either of the learned professions. Casting aside the general intellectual training considered almost or quite essential for the lawyer, doctor and minister, and which is equally desirable and essential for the engineer, I contend that the mental effort required to master the existing knowledge of the world in engineering is much greater than that required for equal attainment in either of the above-named professions.

The engineer, in common with the rest of mankind, is desirous of eminence among his fellows. The first position in the eyes of the world belongs to the successful soldier. No other fame may equal his. It is not given to all of us to become famous engineers, but there is no position in life known to me that presents more opportunities for helpful work for his fellows and for mankind in general than that of the engineer, and as I call to mind the most distinguished engineers that it has been my fortune to know the first thought is not of their eminence as engineers, but of their honesty of mind, and their wise and kindly helping ways. Particularly is this true of our lately deceased fellow-member and past president. When we think of him it is not as the famous engineer—all the world knows him as that—we know and remember the kindly, helpful, lovable friend.

Train Heating in Germany.

Car warming trials are being made on the Prussian state railroads in connection with a special car fitted up with a boiler to supply, in part, the necessary steam which is used for heating. This car is placed at the rear of the train so as to insure a good steam supply to the last cars, those at the forward end of the train receiving steam from the locomotive. The experiments are being conducted on the line between Berlin and Dresden.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The committee on Interstate Commerce of the United States Senate is to hold sessions during the recess to investigate railroad matters, and evidently intends to visit different sections of the country and make a business of it, a resolution to that effect having been passed by the Senate on April 15. The resolution authorizes the following inquiries: Whether section five of the Interstate Commerce law (the section prohibiting pooling) should be repealed or modified; a a similar provision respecting section four (the long and short haul clause); whether the Consular sealing system needs to be modified or regulated and whether foreign railroads should be prohibited from doing business in this country unless they conform to the Interstate Commerce law. As most of our readers know, the investigation of the Consular sealing system is in substance simply an inquiry into the relations of the Canadian railroads, especially the Canadian Pacific, to the roads of this country with which they compete for through business. The Canadian Pacific has secured some freight between the Eastern States and China and Japan, and one of the elements enabling it to do this was the facility with which goods coming in free of duty were shipped direct from Vancouver, B. C., to New York and other Eastern States under seals placed upon the cars by the United States Consul at Vancouver, thus obviating all delay at the boundary between Canada and the United States. The more important matter named in this resolution, that concerning the expediency of pooling, has already been inquired into by the Interstate Commerce Commissioners, who sent out letters to railroad officers and others last Winter. The information then gathered did not lead the Commissioners to take any decided action in the matter, and the discussions in Congress were also without result, so that the law remains as it was. It is not clear what information the Senate Committee expects to add to that already gathered by the Commissioners. The Senate Committee on Interstate Commerce consists of the following Senators: Messrs. Butler, of South Carolina; Gorman, of Maryland; Brice, of Ohio; White, of Louisiana; Camden; Lindsay, of Kentucky; Cullom, of Illinois; Wilson; Chandler, of New Hampshire; Wolcott, of Colorado, and Higgins, of Delaware.

Although the fifth annual Convention of Railroad Commissioners at Washington was not so well attended as last year, perhaps there was quite as much interest in it. There were present 33 commissioners from 18 states, as against 40 commissioners from 28 states last year. While there were several good speeches, the comparatively small amount of discussion was something of a surprise, and perhaps we may justly attribute it to the fact that the official life of most of the commissioners has been too short to give them a feeling of perfect command of their business. Only five of those who were in attendance held office five years ago, and it seemed as if most of them came to the Convention to listen and learn, rather than to impart information For instance, when one commissioner asked for advice on the most difficult subject that they have before them—of making rates—no one had anything definite to suggest, or even had come prepared to state the practical difficulties involved. Possibly, however, this arose from abundant knowledge rather than from ignorance. Perhaps the commissioners have already learned how hard it is to lay down either general principles or special rules for rational rate making. Out side of the formal sessions the subject of electric rail roads was much discussed and the commissioners seemed to foresee that the problems arising in the rapid spread of electric railroads are going to give them a good deal of trouble in the future.

The possibility of saving an important part of the joints in a railroad track by using long rails has occurred to a great many engineers, and it has been discussed for years. Up to this time the practical objections appear to have outweighed the advantages; at least we may safely assume that rails longer than 30 ft. would have been in common use before this if the disadvantages had not been found to be real and important. It may be, however, that conditions have changed so much that it is now economical to introduce a longer rail. The Pennsylvania Railroad, for instance, now uses rails 33 ft. long, saving 10 per cent. of the joints. Two objections to longer rails do not arise with these, for they can be about as easily handled as 30 ft. rails, and are not too long to be loaded on one car. But why not go at once to a 60-ft. rail and get rid of half the joints? At any rate, an interesting experiment in this way is now being carried on by the Norfolk & Western Railroad, as will be seen from an article on another page. These 60-ft. rails are laid on a number of miles and under rather severe conditions, and, so far as we are able to be learn, no difficulty is found in procuring, carrying or using them. The first objections to a rail longer than 30 ft. are that the rail mills are rigged for that standard length; their saws are set and their hot beds are arranged for that length. There is a good deal of trouble now in getting rails properly straightened, and in the finishing department the cold presses, cold beds, drilling machines, etc., are arranged for 30-ft. rails. Another objection that immediately comes up on the part of the railmaker is that the percentage of the weight of metal which would have to be classed as second quality would be increased by adding to the length of the rail; for if a 60-ft. rail was defective in any place, the whole rail would be classed as a second. It appears, however, from the experience of the Norfolk & Western, that these objections really do not arise in practice, as the company agrees to accept a certain proportion of rails of shorter lengths. Doubtless the loss in seconds is pared down to a minimum by this provision. The question of transportation and handling appears, also, not to be of great importance in the experience of the Norfolk & Western. On the Pennsylvania, however, where ten or twelve miles of 60-ft. rails were laid for experiment, it was concluded that the difficulty of transporting and handling them more than overbalanced the advantages gained by saving joints.

The Economy of Small Freight Cars.

"What is is right;" within strict limits, of course. English methods of railroading are good in England, and American methods are good in America; and probably each is better for the conditions of its own country than the other would be. This is so because each is the result of evolution; and in each country the methods of getting and handling railroad traffic, and the methods of conducting the business, have acted and reacted upon each other until it would be hard to separate cause and effect. Therefore the presumption is always against the practical wisdom of trying to adapt English methods to American practice, or the reverse; and it is always against comparisons of service or rates, for as a rule they are not comparable. The service rendered is so different that averages and comparisons of general figures and results are particularly misleading.

But it does not follow that we cannot learn from the English or the English from us. In fact we are learning from each other all the time and modifying details of practice; and the letter on large and small cars which appears on another page suggests one way in which the American practice may yet be very much changed to approach the English.

"A. Z." does not discuss the old question of the relative economies of slow, heavy trains and light, fast trains for the great mass of American freight traffic; this is no longer an open question. He brings up the matter of high class freight for local points. This, too, is an old question, but it is still open. We know that there are many very intelligent American railroad officers who think, as "A. Z." does, that we have carried the indiscriminate use of heavy cars too far; that for local freight smaller and lighter cars and faster trains would be more economical to work, would interfere with passenger trains less, and would serve the public better. "A. Z." puts the case so well that we shall not attempt to restate it; but his statement of it is worth reading.

In fact, the problem is not capable of a general solution for all cases. Whether or not it will pay any given railroad to have a special class of light cars for local freight, and for high class merchandise destined to be carried only moderate distances; whether or not it will pay that railroad to run these cars in special fast trains; whether or not it would be worth while for that railroad to use open cars for such service, with tarpaulins, and rig up station platforms with cranes—all those are questions for that railroad to solve for itself. The answer must be a function of two or three variables—particularly of the relative amount of high class freight to be had and of the proportion that can be carried in carloads; of the demand for quick service and frequent stops; and of interference with passenger trains by slow local freights. To begin with, it will probably be assumed that there must be enough business of this kind to warrant running full trains of light cars, for the light and heavy cars should not be mixed. The light cars must be considerably lighter or the change would not be worth while; and being lighter they must be shorter, for it would not do to make them weaker. But being short it would be dangerous to run them in trains with standard freight cars, with the Master Car Builders' coupler.* As these special cars have but a limited application, they will have a large empty mileage unless closely watched, and therefore may in the end make the proportion of dead weight to paying load even greater than with the standard heavy cars. Thus the objection to a new class of cars is not confined to the car departments, as "A. Z" assumes; the General Manager will have to see that it does not actually increase his non-paying car-miles.

Other difficulties will at once come up, as, for instance, the necessity of more yardroom for storing and sorting another special class of cars; but, as we have suggested above, it is a special question for special cases on which side the balance of advantage will be found. The ratio of merchandise freight to grain or coal or iron or lumber varies enormously on different lines. So the amount of freight carried in less than carloads varies—and, after all, these are the great elements of the problem. If, for instance, the Pennsylvania carries 80 per cent. of its freight in cars which are nominally full cars (say ten tons), as we believe to be the case, the gain in introducing a new class of light cars would be very small compared with the expenses and receipts on the whole of the road's cars. It is true that a lot of 100 or 200 light cars to be used exclusively for business to and from way stations between, say, Jersey City and Philadelphia, might be made to show a saving, provided they could be kept by themselves and provided the other conditions that we have mentioned could be made favorable, but this last proviso might block the whole plan; and the question would still remain, whether we have a right to question the wisdom of the theory which balances the saving on this one division against the likelihood of disturbance of standards throughout the company's system and the inconvenience of maintaining a separate set of standards. It is admitted that in some things a large railroad can better afford a low degree of excellence with uniformity than to have the highest excellence if uniformity must be sacrificed, and perhaps this is one of those things. Certainly a good many roads will at once decide the question in this way against the light cars; but some few of the larger ones, doing a heavy local business to and from one or more large cities, are in a position to experiment with small cars before deciding the matter, and we hope our correspondent will induce one or more of them to try it.

The South Street Collision.

The most notable accident in the February list, which was printed in the *Railroad Gazette* March 24, was the collision on the Philadelphia, Wilmington & Baltimore at South Street Station, Philadelphia, which occurred on Washington's Birthday. The train was one of two or three carrying a Presidential party from Washington to a celebration in New York. The circumstances attending this accident were somewhat remarkable, so that it is worth while to recount them even at this day. It was a well-equipped train, on a road well signaled, and the engineman was not only

*See *Railroad Gazette*, Oct. 3, 1890.

well trained and experienced, but should have been one of the most expert on his division, having run the best engines and the most important trains; and this on a road which has a large number of good runners to select from. In fact, the officers of the road state that his record was exceptionally good. He belonged on the New York Division, having just taken the train to haul it to Jersey City.

It appears that there was no failure on the part of this engineman to heed the signals. In his statement he says:

. . . After passing Marylandville Bridge, at the south end of which I had a clear signal, and coming out on the straight line, I shut off steam and drifted down to meet the next signal at the Delaware Extension switches, and while still on the straight line I tried the air brakes. When just about opposite the switches I reduced the pressure still further and let down the sand. Not feeling the brakes respond, I applied the air for the third time just as we got to the Almshouse road crossing, when I felt the brakes commence to hold. Under ordinary circumstances the train would have stopped, at the speed we were moving, before we passed the Almshouse road crossing. Nearing South street I asked the fireman for the condition of the signal at the crossing of the Central Division, which could not be seen from my side of the engine, and he replied it was "red." Finding we were still drifting after I saw the red signal I did everything I could to stop, reversed the engine and increased the flow of the sand by using the sand-box lever. I did not give the engine steam in back motion for fear the train would slide faster than we were then drifting, which was about 8 or 10 miles an hour. At this time I did not see the West Chester train, being governed in what I did by the red signal alone, and did not see the train until just about as we struck it, when I jumped from the engine. Under ordinary circumstances I was in a position to stop the train before we struck the crossing if the air brakes had responded properly. If I had had another hundred feet to go before reaching the crossing the train would have come to a full stop. The engine did not go that distance after striking the cars of the other train. It was sprinkling snow slightly at the time, and the rails were wet.

Officers of the road say that the weather was the most unfavorable imaginable—snow, slush, and high wind, the snow some of the time intermingled with rain. The most favorable view to take of Jones' behavior is that he failed to appreciate the uncertainties due to the presence of soft snow deep enough to lubricate the rails and brake shoes. Indeed, it has been remarked that an engineman of the same general ability in Northern New York or New England would have been more cautious, and would have stopped sooner, simply because his greater store of experience with snow would have put him more thoroughly on his guard. The most unfavorable view is that Jones, in his anxiety to justify himself, has located the places where he took measures to check the speed too far away from the point of collision. It is not necessary to assume that in doing this he means to falsify. The truth in such a matter would be badly warped within 24 hours in almost any one's mind. The engineer does not say that he applied the emergency brake, which he should do if he followed the rules, for he was passing a red signal. This indicates that he was approaching the signal at speed and hoped to run past without holding up the train. If he had applied the emergency brake at 8 or 10 miles an hour, the stop would have been made within 25 ft. regardless of the snow, ice, wind and some small lack of maximum braking power, and it sounds like nonsense to talk of not seeing a train 20 ft. ahead when both he and the fireman were looking for signals. A collision at 10 miles an hour is not serious; we have seen many of them in car coupler tests. On this theory the engineman hoped to run past the signal at speed as usual, but luck was against him, and the signal was not cleared just before he reached it, as it usually is.

The train consisted of a heavy 8-wheel engine and four Pullman cars. The cars were 12-wheeled, and on three of them there were brakes on all the wheels, but the lack of brakes on the middle wheels of the trucks of the fourth car does not affect the engineman's responsibility much, as it appears that this train was of the same general nature as those which he was hauling every day. The verdict may be very well summed up, therefore, in the language of the Philadelphia *Times*:

No doubt the facts were as stated, but it is also probable that there was a particular desire to make good time in this case, and the engineer of the President's special came up from Gray's Ferry at a greater speed than he would usually have employed, and so was unable to check his train in time. Thus it was the coincidence of a flying special and the slippery tracks rather than either cause singly that brought about the accident.

This is an amateur's judgment, no doubt, but what better can any one say? It is the old question of pressure to make time on one hand and the rules and regulations intended to secure safety on the other. Every serious accident like the present one brings up questions as to what changes can be made to insure that enginemen will more surely keep the proper balance.

In most of the important collisions which have happened recently on roads like the Pennsylvania, the question resolves itself into one of signaling, chiefly the appropriation of money for additional or better fixed signals. In this case it is somewhat different. In fact, taking Jones' statement as it stands his need seems to have been *accurate* knowledge concerning the space necessary for a stop. One of the best educational processes for enginemen in this matter is to make some tests and let the men see them. Not merely a test once in a year or two, to be given to the runners on paper, but actual object lessons with various kinds of trains and quite often. This can be done on regular trips with no cost but the time of two careful men to take the time and measurements. These could afterward be tabulated, with the weights of the trains and other particulars, and circulated. Then the figures will be read by the men with real interest. They will continue to use their own judgment, but they will do this far more intelligently.

We have mentioned the fact that one of the Pullmans had no brakes on the middle wheels of the trucks. The Pennsylvania has been well toward the front in this respect. This would probably satisfy the courts, but it is a satisfaction to know that the officers of this road aim at a higher standard than the common law would require in this matter. The Pullman company has had the reputation in the past of adjusting the brake leverage on its cars so that the shoes would not wear out very fast—so that most of the retarding would have to be done by the other cars in the train. Whether this is true now we do not know, but it is significant that there were no "other" cars in this train.

As many of the fastest trains now run consist wholly of Pullman or similar very heavy cars with six-wheeled trucks, the importance of having ample brake power applied to every wheel is very manifest. The Westinghouse Brake Co. has recommended that brakes be applied to the engine truck-wheels, and this is being done on several roads and on the Empire State express engine which the New York Central will exhibit at the World's Fair. In a long train the retarding power so gained is but a fraction of that which can be obtained by braking all the wheels of heavy six-wheeled cars in proportion to their weight. But in a short train the importance of braking the engine truck wheels is greater. If the Pennsylvania train weighed 270 tons (cars 180, engine 60, tender 30) the possible additional braking power was considerable, as the weight on the engine truck wheels and on the two unbraked axles was probably about 35 tons, or 13 per cent. of the total weight of the train.

March Accidents.

Our record of train accidents in March, given in this number, includes 72 collisions, 102 derailments and 12 other accidents, a total of 186 accidents, in which 40 persons were killed and 185 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Crossing and other.	Tot'l.
Trains breaking in two	7	0	0	7
Misplaced switch	1	2	2	5
Failure to give or observe signal.	6	1	1	8
Mistake in giving or understanding orders	0	2	1	3
Miscellaneous	7	4	6	17
Unexplained	14	4	14	32
Total	35	13	24	72

DERAILMENTS:			
Broken rail	6	Careless running	5
Loose or spread rail	8	Track repairers	2
Defective bridge	4	Bad loading	1
Defective switch	1	Animals on track	1
Defective frog	2	Landslide	4
Wet roadbed	1	Snow or ice	2
Cave-in of coal mine	1	Malicious obstruction	1
Broken wheel	6	Accidental obstruction	3
Broken axle	3	Maliciously misplac'd sw'ch	3
Loose wheel	1	Unexplained	40
Broken brake rod	1		102
Misplaced switch	6		

OTHER ACCIDENTS:	
Boiler explosion	4
Cylinder explosion	1
Broken side rod	1
Cars burned while running	1
Various breakages of rolling stock	1
Other causes	4
	12
Total number of accidents	186

A general classification shows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.	P.c.
Defects of road	0	23	0	23	12
Defects of equipment	7	11	7	25	13
Negligence in operating	29	14	3	46	25
Unforeseen obstructions and maliciousness	4	14	2	20	11
Unexplained	32	40	0	72	39
Total	72	102	12	186	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.
Passenger	33	34	6	73
Freight and other	102	72	6	180
Total	135	106	12	253

The casualties may be divided as follows:

KILLED:	Collisions.	Derailments.	Other accidents.	Total.
Employés	16	10	10	36
Passengers	3	1	0	4
Others	0	0	0	0
Total	19	11	10	40
INJURED:				
Employés	37	27	7	71
Passengers	40	71	2	113
Others	0	1	0	1
Total	77	99	9	185

The casualties to passengers and employés, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	0	52	3	12
Defects of equipment	0	3	10	8
Negligence in operating	3	43	18	42
Unforeseen obstructions and maliciousness	0	3	2	5
Unexplained	1	12	3	4
Total	4	113	36	71

Twenty seven accidents caused the death of one or more persons each, and 43 caused injury, but not death, leaving 116 (62 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with March of the previous five years shows:

	1893.	1892.	1891.	1890.	1889.	1888.
Collisions	72	75	74	67	38	65
Derailments	102	107	128	93	59	99
Other accidents	12	12	10	11	4	8
Total "	186	194	212	171	101	172
Employés killed	36	37	35	35	19	53
Others "	4	3	9	9	3	23
Employés injured	71	93	96	95	54	103
Others "	114	100	95	70	50	108
Passenger trains involved	73	68	81	49	33	75
Average per day:						
Accidents	6.00	6.23	6.84	5.52	3.26	5.55
Killed	1.29	1.29	1.42	1.42	0.71	2.74
Injured	5.97	6.22	6.16	5.32	3.35	6.79
Average per accident:						
Killed	0.215	0.206	0.209	0.257	0.217	0.500
Injured	0.994	0.995	0.901	0.965	0.029	0.227

The passenger train collision record for March started off bravely at 5 o'clock on the morning of the 1st, at Norwood, R. I. As the railroad company has decided to put in a very complete system of block signals on the line where this occurred, public criticism should not, perhaps, be particularly severe in this case. From the published accounts, however, it seems that this case affords an illustration of two features of signaling which should not go unnoticed. First, it appears that the automatic track circuit signals now in use on that road are made to cover a section of a mile or so at each station; and, the stations being close together, that there are consequently short sections between stations which are not covered at all. It appears that this collision occurred in one of these unprotected sections, from which it is possible to imagine some of the circumstances which led the engineman into his blunder. Second, it is said that the brakeman on the foremost of these two trains had thrown off fusees at several places, knowing that he was close to the time of the following train. Whether this indicates that fusees are used so freely that enginemen lose their respect for them, or so rarely that enginemen do not know what they mean, we cannot say.

The next two notable collisions were in New York state, and as the Railroad Commissioners of that state investigate important accidents, we may expect to see full reports of these cases published. On the 6th the Empire State express had a collision which was, we believe, its first serious accident. The conductor of the work train involved in this collision has been held for the grand jury, but according to reports the blame attributable to him is small compared with that resting upon the engineman of the express. The disastrous collision near Valley Mills on the 13th is notable as a case of combined negligence of several men, who apparently tried to clear themselves by bald lying before the coroner. There was a great quantity of evidence at the hearing, and the saloon-frequenting habits of these trainmen were apparently very bad; but the accident occurred in the night, and just how and why the freight cars eluded control seems not to have been determined. The principal moral of the case, therefore, is that the only safe conductor is one who has no desire to go to a saloon and who will see that his men are as strict as himself in this respect.

The rear collision at Lackawaxen, Pa., on the morning of the 16th, is one that ought to be fully investigated, as it occurred at a point where the block system should have surely prevented such a disaster, but this town is just outside of New York state, and Pennsylvania does not worry herself much about railroad accidents.

The derailment at Vandalia, N. Y., on Feb. 25, which we reported a month ago as due to spreading of rails, has been investigated by the State Railroad Commissioners, who say:

"The derailment was caused by the central pedestal casting on the second coach in the train breaking, allowing the journal box to move, skewing the wheel sufficiently to allow it to drop inside the rail, crowd out and spread the rails."

The New York Commissioners also investigated the derailment at Palmyra, N. Y., on Feb. 21, and find the cause as reported in our record; that is, a freight car jumped the rails, broke off bolts and spikes so as to badly weaken the track, and then was rerailed, without the knowledge of the trainmen, by a Latimer bridge guard. We have heard of perverse people who could use this case as an argument against the use of rerailers at bridges, for the passenger train accident resulted in

death and injuries, while it is possible that no person would have been hurt if the freight train had not been rerailed, but had broken through the bridge. But we print the fact, not to encourage that kind of philosophy, of course, but simply to make a complete record and to show that one meritorious safety device cannot provide against all possible dangers.

An accident near Stockton, Cal., on the 30th, which, fortunately, did not do much personal injury, illustrates the value of air brakes on freight cars, especially on small roads and branches where it is necessary to run mixed trains.

A freight train of the Wisconsin Central struck a street car at Oshkosh, Wis., on March 22, badly injuring the passengers. In Denver, on the 19th, an electric car was struck by a locomotive and wrecked, but the passengers escaped. At Birmingham, Ala., on the 16th, there was a similar accident, one or two passengers being slightly injured. A car on a "dummy" road, near Birmingham, was derailed on the 24th and one passenger who jumped off was killed.

There was one other accident in March which calls for comment, but as the throwing of men off from an engine cab by the jarring produced when the brakes are applied is a phenomenon new to us, we forbear to express an opinion, and quote the dispatch as it appeared in the daily papers. Experts on the shaking-up of passengers by kinks in the rails can judge of the case for themselves:

Baker City, Or., March 25.—The westbound fast mail on the Union Pacific met with an accident near this city this afternoon. While running at the usual rate of speed engineer Stevens saw a kink in the rail about 30 yards ahead, and immediately set the brakes. The jarring was so great that Engineer Stevens and Fireman Phelps were hurled to the ground and severely injured. The train did not leave the track, and the passengers escaped with a good shaking up.

In the account which we printed last week of the starting of the Pennsylvania Railroad Company's train consisting of the "John Bull" locomotive and two passenger cars for the World's Fair, we mentioned the fact that Mr. Robert L. Stevens was in charge of the first trial of that locomotive on the track in 1831. Mr. Stevens was, in fact, the President and Chief Engineer of the Camden & Amboy railroad at that time. He went to England in 1830 to learn what could be learned there about railroads, and there he saw the trial of Stephenson's "Planet," and he at once ordered a similar locomotive to be built by the Stephensons for his railroad. That locomotive is the "John Bull," which is now the property of the United States Government, and is preserved in the United States National Museum of Transportation at Washington, and is loaned to the Pennsylvania Railroad Company for the World's Fair Exhibit. The bringing over of this locomotive was but one of the minor services which Robert Livingston Stevens rendered to mechanical and civil engineering in the United States. Indeed, it would be difficult to exaggerate the importance of his work.

It is profitable for a railroad to maintain demurrage rules and to administer them with as much strictness as possible, whether the apparent profit of the office is great or small. As the railroads tell their customers, the chief object in establishing a charge for the use of cars as storehouses is to reduce the amount of such use and not to make a profit out of it. As we have heretofore had occasion to remark, the Alabama Car Service Association, of which Mr. W. H. McClintock, of Birmingham, is the Manager, is one of those which has the courage to keep up its organization in spite of the fact that the collections for demurrage are only about one-half the expenses of the office. The annual report of this Association, which has just been issued, shows that for the 10 months ending with the last calendar year 170,295 cars were handled, with an average detention of 1.13 days. The collections per car handled were three cents and the expenses six, leaving a net cost to the roads of three cents a car, or a total of $5,178. It will be remembered that the chief reason for the low average detention, and the consequent small receipts, in this association, is the large number of coal and ore cars handled, which are unloaded very promptly. In the Birmingham district 135,000 cars were handled during the 10 months, with an average detention by the consignee of only .91 day.

Several announcements of faster time have been made during the past week. The Fitchburg road, according to the Boston papers, will, on and after May 14, have its three express trains run through to Chicago over the West Shore and the New York, Chicago & St. Louis. These trains leave Boston at 9 in the morning and 3 and 7:15 in the afternoon. The time will be about 35 hours. The distance from Boston to Chicago by this route is 1,004 miles, about 18 miles less than over the Boston & Albany, New York Central and Lake Shore. This announcement seems to fully confirm the reports frequently made of late, that the "Nickel Plate" road would put on some new through trains. The reports that the Lehigh Valley will run trains out of New York to go through to Chicago over this road are also repeated, though not with so much definiteness as appears in the Boston reports. The Baltimore & Ohio is to put on one more through train to Chicago, and the present fast limited trains, Nos. 5 and 6, are to run by way of Pittsburgh and over the Pittsburgh & Western. The distance via Pittsburgh is about 53 miles less than by way of Grafton and Bellaire. Several trains west of Pittsburgh will also be made faster. The Erie announces a train to leave New York at 10 a. m. and reach Chicago the next day at 4 in the afternoon. The New York, New Haven & Hartford announces that the time between New York and New Haven is to be reduced to one hour and forty minutes. This is the time now taken by the fastest Boston trains, so that the notice means, we suppose, that some of the other trains, which now take 110, 120 and 130 minutes, will be made faster. The fast trains running between New York and Washington over the Central of New Jersey, the Philadelphia & Reading and the Baltimore & Ohio are to run into the new station of the Reading at Twelfth and Market streets, Philadelphia, after May 14. This seems to indicate that the location of the station at Twenty-fourth and Market streets, where passengers now have to go to take these trains, is not regarded as very favorable. The detour which these trains will have to make to reach the Market street station will be rather longer than that which the Pennsylvania trains make in running to the Broad street station. The Reading, like the Pennsylvania, makes an exception of the two trains, one north and one south, which run through in five hours. These will continue to run as at present.

NEW PUBLICATIONS.

Sewage Treatment and Sludge Disposal, by W. Santo Crimp, M. Inst. C. E. *Engineering Record* office, London, 1893; 8vo., pp. 26.

This little pamphlet by a civil engineer, who has had considerable experience in the designing and construction of works for the disposal of sewage, is a valuable compendium of information on the subject of which it treats, and cannot but prove useful to the amateur for instruction and to the engineer for reference and refreshing of the memory. The subject is treated in a systematic way, beginning with the definition of sewage as "mainly the fouled water supply of a community. . . . The sewer, indeed, is the very antithesis of the water-main." The composition of sewage is then treated and the quantity of sewage for which discharging capacity must be had in the main outfall sewers; various methods of clarification and purification of sewage are briefly described, and the method of disposing of the sludge by using a filter press is advocated more particularly. The writer, however, is not by any means an agent for or advocate of any particular method, and shows himself to be a good engineer by his closing remarks: "The disposal of sewage is no longer the troublesome problem of past years. The principles are now so well understood that in order to insure success all that is necessary is, first, to make a comprehensive survey of every situation in connection with each particular case, and then to apply the most suitable remedy, finally remembering that good management must be insisted upon as a vital element of success."

Pumping Machinery.—A Practical Handbook relating to the construction and management of steam and and power pumping machinery, by William M. Barr, Mem. Am. Soc. M. E.: Philadelphia. J. B. Lippincott Company, 447 pages, 260 engravings, Price $5.00.

This is a very complete treatise on the design and construction of American trade pumps, the descriptions of the various designs being accompanied with copious illustrations of all the important details. To quote the author, "the merit of a handbook like this consists largely in the judicious selection and arrangement of its contents rather than upon a strict originality." This is certainly true, and upon it depends the usefulness of a work of this character. All the designs shown and described are, with few exceptions, those which are in successful daily use, few if any being given which have been condemned by engineers and users. The great majority of the designs possess unmistakable individuality, which, of course, is natural; but they represent "the accumulated facts of a large and successful experience," and can, therefore, be accepted by the reader with confidence. A striking feature of the book is the complete and systematic classification of its contents, and another is the number of very useful tables. Among the latter may be mentioned: The properties of circles applicable to valve calculations, Dimensions and capacities of air chambers, Speeds and capacities of pumps of various strokes, Properties of compound steam ends, Mean effective pressures for engines, condensing and non-condensing, etc. Chapter IV., which is devoted to water valves and seats, is admirable in its completeness of analysis and illustration, and contains some interesting diagrams. The remarks on valve area and speed of pumps, and the speed at which pumps will run noiselessly, are timely and should be read by many pump builders. Another excellent chapter is that on water end design, as is also that on mining pumps. The work concludes with a chapter on duty trials of pumping engines, and one describing various makes of high duty pumping engines, the former being an abstract of the committee report of the American Society of Mechanical Engineers. Taken as a whole this volume is the best of its class which has yet appeared, presenting the subject in a clear and readable manner, making no attempt to enter into the theory and mathematics of pump construction, and avoiding the temptation to borrow largely from trade catalogues. It cannot fail to be of value to those who wish to inform themselves regarding the construction and proper selection of pumps for various purposes.

TRADE CATALOGUES.

Illustrated Catalogue of the Acme Machinery Company, Cleveland, Ohio.—This catalogue shows bolt heading, upsetting and forging machines, adaptable to a great variety of work. A number of most ingenious machines are very clearly illustrated.

Electric Car Heating.—Part XII of the illustrated catalogue of the Consolidated Car Heating Company shows the electric heating system recently described in the *Railroad Gazette* as applied to street cars. It shows also a storage system as adapted for cable cars.

Price List of the Crescent Steel Company.—This company, which has offices at 136 First avenue, Pittsburgh, 480 Pearl street, New York and 64-66 South Clinton street, Chicago, has just issued a new price list. The list includes tool steel, spring steel, machinery steel, steel forgings and a considerable further variety of the very high-class product made by this company.

Tools for the Use of Trackmen.—Blue-prints issued by the Verona Tool Works, Pittsburgh, Pa.

This is a collection of alleged blue-prints showing a considerable variety of track tools, nut locks, etc., made by the Verona Tool Works. They call special attention to the track chisel for cutting rails, as being generally the hardest tool from which to get satisfactory results It is claimed that this chisel is as near perfection as a tool can be made. The collection is really one of the most interesting trade catalogues that we have seen for a good while.

Machinery for Wood-Working. Illustrated catalogue of the Berry & Orton Company, Twenty-third and Arch streets, Philadelphia, Pa. 1893.

This is a remarkably complete and handsome catalogue of 264 large octavo pages profusely illustrated, with an index. It would be impracticable to attempt to tell what it contains; it would be easier to say what it does not contain in the way of wood-working machinery. The company has now occupied its new plant for about one year, having more than four times the floor space which it formerly used. It has excellent shipping facilities, the tracks of the Philadelphia & Reading and the Baltimore & Ohio entering the yards; and for greater convenience of the company's customers a salesroom has been established at 136 and 138 Liberty street, New York City.

Railroad Co-operative Supply Associations in France.

The Wholesale Wine and Spirit Traders' Association of France complained in May, 1890, of what it called an unjust discrimination made by the railroads in favor of various co-operative supply associations of their employés, some of which were organized by the railroad companies themselves. In consequence of this complaint the Minister of Public Works called upon the railroad companies for information on the subject, and the result of his inquiries has now been made public.

The Northern Railroad company maintains 10 different establishments, exclusively for the benefit of its employés, the oldest of which, that at La Chapelle, is no less than 46 years old, having been opened March 16, 1847. It carries goods from the place where purchased to these stores, and from the stores to the station of the purchasing employé, entirely without charge, as freight for the company's use. An exception is coal, on which half the regular rates are charged from the mine or yard to the employé's station. Its employés have established for themselves two bread and meat stores outside of the territory of the company, and these pay the regular rates of freight.

On the Eastern Railroad the employés have established co-operative associations on their own account in fourteen places. The company advanced part of the cost of the first establishment of some of these, and it grants various reductions in the freights on their shipments.

The Western Company carries everything to the great co-operative institution of its employés at a uniform rate of 0.56 cent per ton per mile, and all purchases made of the institution by its employés are carried to the stations where they live without charge.

The Orleans company has established a store which sells everything to its employés at cost. Shipments made for it are charged 1.40 cents per ton per mile, unless the public rates are lower. Similar rates are made for co-operative bakeries, organized exclusively by its employés at eight stations on its system.

The Paris, Lyons & Mediterranean has encouraged its employés to form co-operative consuming associations, and on shipments from their stores gives a rebate of about one-third of the regular rates. There are 41 such associations on its system, 36 exclusively of its employés. The latter alone are allowed rebates.

The Southern company gives no rebates to such associations; but purchases made of its great store in Bordeaux it carries to its employés without charge, whatever the distance.

The State Railroad established a store for its employés in La Rochelle in 1888, and it charges a uniform rate of 0.56 cent per ton per mile on all shipments either to or from it. The same rate is charged the co-operative butcheries and bakeries established by its employés.

The matter having been submitted by the Ministry of the Inspecting Bureau of the Railroad Council, the latter finds that the railroad employés have the same right as other citizens to form co-operative associations to save the profits of middlemen; that advantages in freights granted such associations are to be looked upon as slight increases in the employés' wages, protecting them from debts, and therefore beneficial, and that such enterprises, when established by the railroad companies, are not to be considered as trading enterprises in the meaning of the law, because they yield no profit, but even involve some sacrifice. As for establishing uniformity in such associations, as had been proposed, the report regarded it as harmful rather than useful. This report was adopted as the decision of the Ministry and the Wine and Spirit Traders' complaint was declared unfounded.

TECHNICAL.

Manufacturing and Business.

George H. Wheelock, formerly with the Chicago Bridge & Iron Co., has formed a company to be known as the George H. Wheelock Bridge Company, with offices in Chicago.

The Air-Brake Pressure Regulating Co., capital stock $100,000, has been incorporated in Illinois by Benjamin Wolhaupter, Alexander C. Ray and J. P. Wiborg.

The Boyer Railway Speed Recorder Co. reports that the Northern Pacific and the "Soo" roads have adopted its speed recorders. The Northern Pacific has nearly 300 recorders now in use, and is adding to the number at the rate of about five or ten a month. The "Soo Line" has nearly all its engines equipped with these machines.

The Crosby Steam Gauge Co. state that sales of the Johnstone blow-off cock for locomotive boilers is increasing and that there is now quite a demand for it. This valve was illustrated and described in the *Railroad Gazette*, Aug. 19, 1892.

Mr. J. W. Ferguson, M. Am. Soc. C. E., sometime ago resigned the position of Engineer of Construction on the Erie and established himself in business in Paterson, N. J., as an engineer and builder, making a specialty of factory and warehouse construction of the slow burning type. He makes plans, specifications and contracts for machinery as well as buildings, and we are informed that his work has been very successful. He has designed or built, or both, a number of very large mills in Paterson as well as the new Clark Thread works at Newark and some railroad shops.

The year following the reorganization of the Westinghouse Electric & Manufacturing Company from April 1, 1892, to April 1, 1893, is reported to have been a very successful and profitable one. During last March the company shipped goods to the value of $857,000, making the total output for the year about $5,800,000. The capacity of the works has been about doubled during the year by the addition of new machinery and the lease of the old air-brake works in Alleghany. The net earnings, after providing for ordinary and extraordinary expenses, have averaged about 25 per cent. of the sales, and there is an increase of over one million dollars in the surplus after providing for 7 per cent. dividends on the preferred stock. The company now employs in Pittsburgh, Alleghany and Newark between 3,600 and 3,700 men.

Iron and Steel.

Work on the new Bessemer plant now being built by the National Tube Works Co., at McKeesport, Pa., is being pushed rapidly, and it is the expectation to commence the manufacture of Bessemer steel about Sept. 1 next. The new plant will have a capacity of about 800 tons a day, and is being erected by the Pittsburgh Iron & Steel Engineering Co., of Pittsburgh.

The Lehigh Iron Co., Allentown, Pa., which failed some time since, has been reorganized, a limited partnership having been formed to run for 20 years. The capital stock is $63,000, and the officers William H. Ainey, President and Treasurer, and Frank J. Remmel, Secretary.

President N. Baxter, Jr., of the Tennessee Coal & Iron Co., says that the location of the new steel mills to be erected in Alabama by that company has not been determined upon, but that they would probably be built at Ensley or Bessemer, Ala.

New Stations and Shops.

The plans and specifications for the new shops of the Southern Pacific in Ogden, Utah, have been completed and bids for the buildings will probably be awarded next week. Besides the machine shops the company will build a roundhouse and warehouse at Ogden.

The Baltimore & Ohio is removing the machinery from its present shops at Wheeling W. V., and Bellaire, Ohio, to Benwood Junction, which has been made the terminus of the Wheeling & Pittsburg, Central Ohio, and Wheeling and Grafton divisions. New roundhouses have been erected at Benwood Junction and all terminal facilities are to be put in at that point.

The Cleveland, Lorain & Wheeling has, it is stated, made arrangements with the Baltimore & Ohio to occupy the shops, roundhouses and other buildings at Bellaire, vacated by the Baltimore & Ohio; the Cleveland, Lorain & Wheeling moving its terminus from Bridgeport, Ohio, to Bellaire.

Foreign Notes.

The royal statistical bureau of Prussia gives some interesting figures as to the number of steam engines in use in that state for the generation of electricity for light and power. According to these there were, in 1892, 998 engines, representing 55,396 H. P., employed exclusively in driving dynamos of engines driving both general machinery and dynamos, there were 282, figuring up 13,691 H. P., thus making altogether a total of 1,280 engines developing 69,087 H. P.

Of all the railroad tunnels now in existence the St. Gothard still stands at the head of the list in point of length, measuring, as it does, 14,990 metres, or about 9⅓ miles. The proposed Simplon tunnel will measure in the neighborhood of 20,000 metres, or about 12¼ miles.

Wire Glass.

One of the recent ingenious productions is what is called wire glass, which is a wire netting enclosed in the substance of a sheet of glass. The wire is thus protected absolutely from the atmosphere and consequently saved from corrosion and deterioration. On the other hand, it holds the glass together and in position in case of cracking. It is said that experiments which have been made with hammers, crowbars, bullets and other missiles show the impossibility of seriously damaging a sheet of glass by a single blow at one spot. It has also been found to be very efficient for fireproof partitions, for while the glass will crack and even melt the sheet remains in place and forms an effective screen. This material is especially recommended for large glass roofs, as, for instance, for train sheds and shops and for skylights for buildings of any sort. The combination has a great advantage over the ordinary one of putting netting under or over the glass, aside from the mutual protection which the wire and the glass give each other, that is, the surfaces are left smooth so that they may be easily cleaned and there is less tendency to collect dirt. Wire glass is used in the roof of the trainshed of the new Philadelphia & Reading Terminal Station in Philadelphia. This article is handled by the Manhattan Equipment Company, 115 Broadway, N. Y.

The Pennsylvania Steel Company.

We are sorry to be obliged to record that the Pennsylvania Steel Company and the Maryland Steel Company have been put into the hands of Receivers. Major L. S. Bent and the Girard Trust Company of Philadelphia have been appointed Receivers of the Pennsylvania Steel Company, of which Major Bent is President; and Mr. F. W. Wood, President, has been appointed Receiver of the Maryland Steel Company. It is said that the companies have found it impossible to renew notes for considerable amounts which are maturing, but that both are in good condition as regards orders on hand, both as to quantities and contract prices. A brief statement of the financial condition of these companies follows:

Pennsylvania Steel Company (Paid-up capital $4,500,000.)

Assets.

Plant and machinery	$3,000,000
Accounts receivable	1,300,000
Stock on hand	2,000,000
Total assets	$6,300,000

Liabilities.

Bills and accounts payable	$4,000,000
First mortgage bonds	1,000,000
	$5,000,000

Maryland Steel Company.

Assets.

Property and plant	$6,550,000
Bills receivable	500,000
Raw material and manufactured product on hand	2,000,000
Total assets	$9,050,000

Liabilities.

Mortgage, secured	2,000,000
Floating debt, unsecured	1,600,000
Total liabilities	$3,600,000

It is said that work will go on with a full force of men and all contracts taken will be filled as promptly as if no change had been made. Both companies are in better condition than ever before to turn out a large product. The large outlay (about $6,550,000) at Sparrow's Point is represented not only by the plant of four blast furnaces and perhaps the most complete Bessemer plant and rail rolling mill in the world, but also by a large and well-equipped engineering shop and foundry, and certainly one of the most complete steel ship building plants in the country, as well as all the buildings of a village of 3,000 to 4,000 inhabitants and a thousand acres of land, with six miles of water front. The plant as a whole has but just reached a large earning capacity. With a large stock of material at both Sparrow's Point and Steelton, with orders on their books at reasonably paying prices to keep them running at least four months we see no reason why they should not work out their present embarrassment in the near future.

The Schizeophone in Railroad Service.

The "schizéophone," the invention of Captain Louis de Place, is again being much spoken of in foreign journals, having, of late, been somewhat extensively used in a practical way. The "schizéophone," as may be remembered, is an instrument designed to detect imperfections in pieces of metal, car axles, for example, rails, rolled beams, etc,, and, in the main, consists of a microphone and telephone combination, and a mechanical sounder. If this sounding hammer is made to tap against a perfect piece of metal, without flaws or blow holes, for example, it produces in the telephone a sound of a certain, constant strength. If, on the other hand, blow holes or other similiar defects are present, they act as resonators and the intensity of the sound in the telephone is much increased. Trials made with the instrument on a large number of rails for the Northern Railroad of France, at Ermont, are said to have satisfactorily demonstrated its reliability. Rails which it indicated to be imperfect were subsequently broken at the particular points noted, and in all cases more or less serious internal defects were found.

Cast Steel Stern Posts.

The Standard Steel Casting Co., of Thurlow, Pa., has just completed and shipped an open hearth cast steel stern post for the United States cruiser "Columbia," now in course of construction by the Cramps. It is claimed that this is the largest steel casting ever made in this or any other country. The casting is in one piece and weighs 49,520 lbs. The same company has contracts for stern posts for the new war ships "Iowa" and "Brooklyn," also to be built by the Cramps, and it is estimated that the weight of each casting will be more than double the weight of the one just completed.

The Rail Market.

In the East, and to a less extent in the West, the appearance of very considerable blocks of old steel rails, fit to relay, is a feature. The trunk lines, forced to put in heavy rails, are taking out 60-lb. rails, many of which are still in excellent condition. Such rails are being offered at $20 a ton.—*Iron Age.*

Coupler Tests of the Western Railway Club.

A part of the car coupler tests that were arranged by the Western Railway Club were made on Monday, April 17. It was intended to make the pulling tests at Machinery Hall, World's Fair ground, on that date and the day following, but the Rhiele machine, on which the pulling tests were to have been made, did not come in time. It was then decided to make the drop tests at the Sargent company's works on the 17th and postpone the tension tests until the machine could be put in place and power furnished to run it. The drop tests developed a great deal of enthusiasm, as there was a large number present to witness them, and nearly everyone stayed till the last coupler was tested. All the representatives of the coupler companies seemed well pleased with the thoroughness of the tests and the excellent arrangements for taking the data. Several were heard to remark that they thought the tests very complete, and that no partiality could be shown. There were 34 couplers received for the drop tests, of which 28 were tested, the 28 representing 16 different makes. Of this latter number four stood the test, which was three blows of a 1,640-lb.-weight falling 10 ft., and two blows of the same weight falling 15 ft. The couplers that stood this test were not tested further. Of the 16 makes tested, four withstood the five blows prescribed by the M. C. B. proposed specification and the honors were even between the malleable iron and steel couplers, two of each receiving the five blows without breaking into two or more pieces. Of those that failed one broke into so many pieces when struck the first blow at 15 ft. that a basket was necessary to collect them, and it was an especially hard task for the photographer to get the pieces arranged so as to show where the coupler was weakest, or where it had broken first. The drop tests will be completed later.

Electric Lights Run by Power from Car Wheels.

A passenger car of the Central of New Jersey, fitted with electric lights and apparatus for running them by means of gearing worked from the axles of the car, was exhibited on that road last week. The scheme was devised by Samuel Young and Morris Muskowitz, of Newark, N. J. It is said that the experimental trip was successful.

The Fontinettes Elevator.

The hydraulic canal boat lift at Les Fontinettes has been put out of service by injury. The masonry foundation has been undermined for some time by a spring, against which the necessary precautions were not taken at the time of building. The result is, that the guides have got out of plumb, and the lift no longer works normally. The lift will be closed for several months during repairs.

The Monier Beton Construction.

The Monier system of béton construction has recently been subjected to trials at Berlin, Germany. A stairway, built up of Monier béton slabs 2 in. thick, was loaded with water-soaked bricks, about 655 lbs. per square foot, without giving way or even showing any appreciable deflection. A Monier arch about 2½ in. thick and of 13.12 span was similarly loaded over half its length with about 552 lbs. per square foot without showing any signs of distress.

Conduit Electric Road for Vienna.

A street railroad project, recently brought forward at Vienna, Austria, provides for an electric road for that city to be modeled somewhat after the much described electric road at Buda-Pesth, in which the current is taken from an underground conductor. Detailed plans for a belt line are said to have been already prepared, and arrangements to have been made for its construction by the firm of Siemens & Halske. The current is to be furnished by the General Austrian Electric Company which has just completed its second large central station at Vienna.

Experiments with Low Temperatures.

Some interesting influences of extremely low temperatures, noted by Professor Raoul Pictet in his Berlin laboratory, are referred to in the Riga *Industrie-Zietung*. By his well known use of a mixture of sulphurous acid and carbonic acid and its derivatives, Professor Pictet has produced temperatures as low as —130 deg. C., liquefying atmospheric air and by means of this further reducing the temperature to —200 deg. It was found that at a temperatore of —158 deg. C. all chemical relations ceased in the bodies experimented upon and no combinations could be effected. Singularly enough, however, the chemical affinities are re-established when an electric current is passed through the cold bodies. Still more remarkable are the electrical properties of such cold substances. At —150 deg., for example, all the bodies under experiment were found to be good conductors of the current, wood, among others, being equal to copper in this respect. Below —100 deg. we find, as Professor Pictet aptly puts it, the polar department of physics, of which, at the present time, very little is known and in which some remarkable phenomena are to be looked for.

THE SCRAP HEAP.

Notes.

The Michigan Central is examining employés for color blindness.

The Cincinnati, New Orleans & Texas Pacific has discharged a large number of clerks from the general offices, and also two or three traveling passenger agents.

The report that a new railroad law had gone into effect in Mexico was without foundation; a preliminary report of an examining board having been magnified by a reporter into a piece of actual legislation.

The strike of shopmen on the Atchison, Topeka & Santa Fe was reported last Saturday as impeding freight traffic to a noticeable extent. It was said that the number of locomotives needing repairs was so large that livestock shipments had to be refused. We are unable to say how far these reports are true. The road seems to have got new men without great difficulty, and it was reported on Tuesday of this week that the strikers had surrendered. On the Southern lines of the Atchison the trainmen seem to have taken advantage of the disaffection of the shopmen to start up a rumpus in the transportation department. The railroad company secured injunctions at several points restraining the strikers from interfering with new men.

A severe rainstorm on April 20 did a good deal of damage to the Staten Island Rapid Transit road, and also inundated a branch of the Central of New Jersey in the vicinity of Elizabeth, stalling a passenger train in deep water. An oil tank overflowed and the oil floated on the water of Staten Island Sound to such an extent that considerable damage was done by fire, the oil having been ignited by boys. The trestle approach to the high bridge of the Baltimore & Ohio caught fire from the oil and was damaged about $7,000 worth. Considerable damage was done at New Brunswick, N. J. The high tide damaged the railroad track badly near Barnegat City Junction, N. J. On the same day a tornado destroyed several miles of telegraph lines in northern Mississippi, and high water undermined the tracks of the Toledo, Ann Arbor & North Michigan road in Toledo, O. At Indianapolis, Ind., a wooden freight shed of the Cleveland, Cincinnati, Chicago & St. Louis road, 600 ft. long, was blown down.

The investigation of the affairs of the New York, New Haven & Hartford road by the Massachusetts legislature seems to have dwindled to small proportions. So far as could be learned from the reports of the proceedings, the investigation was rather an aimless one, and was largely given up to subjects not covered by the original resolution, on which the inquiry was based. But few questions of importance had been asked when the New Haven and the New England roads made some sort of an agreement which seems to have satisfied the complainants in the case. It appears that the Pennsylvania, in withdrawing its through billing arrangements on eastbound freight from the New York & New England, based its action on a complaint which the New England road had made, that the proportions allowed to it were not large enough. This would justify the Pennsylvania in its action, but in the restoration now decided upon it is said that the New England road accepts the old proportions, and the public is still left without accurate information as to the essential features of the difficulty.

World's Fair Notes.

The Mason air signaling system will be shown near the air brake exhibits. It will have piping for 15 cars.

The Dickson Car Wheel Company, of Houston, Tex., has sent as its exhibit a number of Barr chilled car wheels, the wheels being made of Texas iron.

The Boyden Company is just arranging a rack to be the equivalent of a train of 100 cars. This company will show pumps, valves and other devices.

The exhibit of the Boyden Brake Company, of Baltimore, consisting of 100 brakes in a working frame, has been put in its place in the Transportation Building.

The exhibit sent by Italy, consisting largely of art treasures, fills cars enough for six full freight trains. It was transferred from the steamers to the cars at Portland, Me.

The Crane Company has a rack of 100 cylinders and piping; the pipes are bent in arches diagonally across the space occupied, and the cylinders are arranged under the arch.

The air for use in all these exhibits will be supplied from the large compressor of the Exposition Company, and the locomotive air pumps will be operated by compressed air from the same source of supply. These latter will be worked only for the purpose of exhibition.

A special train of 10 locomotives and 12 cars, part of the exhibit of the Baltimore & Ohio Railroad, left Baltimore on Saturday night for Chicago. Among the locomotives are the "Atlantic," the first of the "grasshopper" type, and the "Mazeppa," the first of the "crab" type.

A novel scheme will be inaugurated during May by the steamer "Bon Voyage," and if the undertaking proves successful will be continued during the Exposition period. The intentions are to use the steamer as a hotel as well as for transportation. The steamer will run on Lake Michigan between Grand Haven, Muskegon and Chicago, making weekly trips. At Chicago it will anchor off Jackson Park, and board the passengers during their sojourn there. The boat is now being put in readiness for the service. It will accommodate about 400 people.

The exhibit of the Westinghouse Air Brake Company in the Transportation Building will include two racks of airbrake cylinders connected with pipe and hose as in practice. Each rack represents a 50 car train, and arrangements are made so that the two racks may be connected together, making the equivalent of a train of 100 cars. There are two standard air pumps on the main reservoir of one rack and two 9½-in. pumps on the main reservoir of the other rack. There are also engineers' valves, governors and all the latest improved airbrake devices for locomotives.

The New York Air Brake Company has a rack, the equivalent of a 50-car train; it is arranged with the pipes radiating from a central space and arching over the brake cylinders, both ends of the pipe being toward the inner space, the radius of the outer bend being about two feet. There is also an exhibit representing a 10 car passenger train. The train pipe in this case is coiled around the auxiliary reservoirs, and the brake cylinders are above them. The New York company will also exhibit three duplex pumps, a vacuum brake and engineers' valves and other specialties.

H. K. Porter & Co. have four locomotives placed: One a light standard gauge locomotive and three narrow gauge loggers and city and suburban locomotives. The Old Colony exhibits a locomotive of its own make. It is of the American type. The Richmond Locomotive & Machine Co. also has on the grounds one locomotive built for the Chesapeake & Ohio. The Rogers Locomotive Works has placed two, one at the head of the Pullman train and another built for the Illinois Central. This latter has a Belpaire boiler, and the firebox is between the frames. It has eight wheels connected and a pony truck.

The Rhode Island Locomotive Works has now two representative locomotives: One a two cylinder compound for the Chicago, Milwaukee & St. Paul, with six coupled driving wheels, 78 in. in diameter and four wheel truck. This engine has a two wheel truck under the back end of the engine. It has a wagon top boiler with firebox between the frames; the back driving axle is under the firebox. The tender has a water scoop. There are cast iron wheels under the tender. The other locomotive has eight driving wheels, 50 in. in diameter, and pony truck. It has a wagon top boiler. It was built for the Soo Line.

The great 120-ton Krupp gun, an illustration of the transferring of which from the boat to the car was given in the last issue of the *Railroad Gazette*, has arrived safely in Chicago, and reached its resting place in the Krupp pavilion at the Exposition. It slipped into the carriage that was ready to receive it without the least difficulty. The special car that was used to transport the gun from the wharf to Jackson Park has been placed on the transportation tracks and will be one of the exhibits. It will undoubtedly attract the attention of railroad men as the heaviest and strongest car ever built in America.

The exhibit of locomotives has been greatly increased during the last week. The largest number yet received from one company is nine, from the Brooks Locomotive Works. Of these, eight are in the annex to the Transportation Building, and one on a pedestal in front of the Jackson Park terminal railroad station. The one on the pedestal has cylinders 20 in. in diameter and 26 in. stroke. It has eight connected drivers 54 in. in diameter and a four-wheel truck. The boiler is of the Belpaire type with the firebox between the frames. The engine is equipped with the New York air brake, one non-lifting and one lifting Monitor injector, the lifting injector being placed just back of and supported from the back head above the furnace door and located so as to be conveniently operated from the right side. The overflow from the non-lifting injector is placed in the cab, that it may be seen conveniently. The Nathan sight feed lubricator is in the usual position. The tender frame is of steel. The locomotive is for the Great Northern Railroad. Another interesting locomotive from the Dunkirk works is a tandem compound for the Great Northern; one similar to it is now running on that road. It is eight-wheel-connected, with a pony truck. The make and location of the different appurtenances are the same as those on the pedestal locomotive. This company shows also a locomotive for the Cincinnati, Hamilton & Dayton, a two-cylinder compound for the Lake Shore & Michigan Southern, a suburban for the Chicago & Northern Pacific, and several others built for the Great Northern. There are six different types represented. Excepting the C., H. & D., the tender frames of all are of steel. Nearly all are equipped with the Nathan lubricator, the Monitor injectors and the New York air brake.

Cramps' Shipyard.

A circular of the Cramps shows that they are building seven United States cruisers and battleships with an aggregate displacement of 64,142 tons, and a total of 103,000 H. P. For these they are to receive $20,522,000, besides premiums of $50,000 on five for each quarter knot over the specified speed, and $25,000 per quarter knot of extra speed on the two others. In addition to the vessels for the Government, they are building a yacht of 460 tons with a speed of 18 knots, and four steamers for the American Line with an aggregate tonnage of 60,200 tons, viz., two of 10,600 and three of 13,000 tons each.

Two of the cruisers building now for the government, the "Columbia" and "Minneapolis," of 7,475 tons displacement and 21,000 H. P., are to attain a speed of 21 knots each; these have triple screws, all the other twin screws. Two armored cruisers, the "New York," of 8,150 tons, and the "Brooklyn" of 7,150 tons, have 16,000 H.P. each, and are to attain a speed of 20 knots. The sea-going battle ship, "Iowa" is to have 11,296 tons displacement and 11,000 H. P., with a speed of 16 knots; and the two coast line of battle ships, "Indiana" and "Massachusetts," with 10,298 tons displacement and 9,000 H. P., are to attain a speed of 15 knots. These vessels have 18-in.-armor and carry four 13-in.-rifles, with eight 8-in. and four 6-in. breech-loading rifles, besides secondary batteries. The other vessels have less armor and lighter batteries, the 21-knot cruisers having only a protection deck four inches thick and no gun heavier than one 8-in.-breech-loading rifle.

Four thousand men are employed by the Cramps, and between the warships and those of the American Line some 90,000 tons of steel and iron will be required. Secretary Herbert, as Chairman of the House Naval Committee, called attention not only to the excellence of our ships, but to the great decrease in cost, saying on this point that the cost of the material, excepting armor, entering into the construction of our ships had decreased to one-half, and the cost of the ship to two-thirds, of what it was six years before, and there is small reason why we should not soon occupy the same position as shipbuilders which we hold as locomotive builders. We are now producing more of everything required for the construction of either a war or merchant vessel than any of our competitors, excepting only open hearth steel, and under two or three years of active demand for that we could easily double our production.

The Chronology of Natural Gas.

An article in the *Iron Trade Review* gives the following dates in the development of this comparatively new fuel:

In 1821, natural gas first used for illumination, Fredonia, N. Y.

In 1838, natural gas first used for heating purposes, Findlay, O.

In 1841, natural gas first used for saltmaking, West Virginia.

In 1860, natural gas first used for steam production, Oil Creek, Pa.

In 1870, natural gas first used for domestic fuel, shore of Lake Erie.

In 1873, natural gas first used for ironmaking, Leechburg, Pa.

In 1883, natural gas first used in plate glass manufacture, Creighton, Pa.

In 1883, natural gas first piped for general supply, Pittsburgh, Pa.

In 1884, natural gas discovered in large quantity at Findlay, O.

In 1886, natural gas discovered in great quantity in central Indiana.

The amount of capital now invested in the distribution of gas from the various fields is estimated in the article referred to as fully equal to $100,000,000. He holds that within the 10 or 15 years during which natural gas has been counted worthy of much consideration as a source of domestic and manufacturing fuel, it has grown to be of more importance as an element of profitable employment than petroleum, and though the supply is said to be failing in some localities the Trenton limestone of Ohio and Indiana has been added to the Pennsylvania source of supply and now the Clinton formation bids fair to afford another valuable source.

The New York & New England Express Contract.

Judge Barrett of the New York Supreme Court has denied the motion to make permanent the injunction which the American Express Co. obtained against the United States Express Co. and the New York & New England Railroad enjoining the United States Co. from interfering with the American Express Co.'s express business over the New York & New England Railroad.

A Railroad Station as a World's Fair Hotel.

The Northern Pacific is to try a new experiment during the Exposition period, and if it proves successful it may be continued after the closing of the Fair. When the Grand Central passenger station in Chicago was built no expense was spared to make it one of the finest buildings of its kind ever built. It was made large and commodious with the expectations of furnishing terminal facilities for a number of roads, and the office portion was made correspondingly large, so that the city offices of the tenant roads might be in the station building. So far, the Baltimore & Ohio and the Northern Pacific are the only roads using this terminal, and the office facilities, as well as the station facilities are by no means entirely taken. This leaves many vacant rooms in the office part of the building that have never been entirely finished.

The officers of the road have had many inquiries from people along its lines for accommodations during the Exposition, and being unable to secure rooms for such persons it has been decided to use the unoccupied portion of the station for hotel purposes. There will be 150 rooms available for guests located on the third, fourth and sixth floors. Meals will be served in the station restaurant. It is said that special trains will run from the station to the Fair Grounds for the convenience of the guests. If the noise of arriving and departing trains is not found of too great inconvenience it is probable that part of the station will be used for hotel purposes until the demands for more office room in the building make it necessary to discontinue that use of the building.

South Carolina Tax Cases Decided Against the State.

The South Carolina tax cases were passed upon by the Supreme Court of the United States on April 24, the opinion being delivered by Chief Justice Fuller. The suits came up on the petition of Sheriff Tyler, of Aiken County, for a writ of habeas corpus to release him from imprisonment under the judgment of the Circuit Court of the United States that he be fined $500 for contempt. He had seized a train on the South Carolina Railroad, upon a warrant issued by the state authorities for the collection of taxes, which were in controversy. The road was in the hands of a receiver appointed by the United States Court, and he was adjudged guilty of contempt for failing to release the property under order of that court. He appealed to the Supreme Court for relief. Chief Justice Fuller, in denying the application of the petitioner for the writ, said the seizure of the property by force was unjustifiable and could not be defended. The claims of the state for taxes are not superior to the general rule which makes property placed in the hands of a receiver subject to the orders of the court. They are to be determined in a regular way and in the proper manner. The action of the Circuit Court, Chief Justice Fuller said, was in no sense an action against the State of South Carolina, which, it was contended, could not

maintained under the eleventh amendment to the Constitution. In conclusion, he said the Circuit Court was equipped with the fullest power to protect its dignity and to enforce its mandates, and its use of these powers in the case in point could not be reviewed. Therefore the petition for a writ of habeas corpus was denied. The same judgment was announced in the cases of Sheriffs Riser and Gaines.

Ready for All Emergencies.

The Committee on Information and Courtesy of the American Society of Civil Engineers are receiving kind offers of co-operation from nearly all members of the Society. One answers the query as to foreign languages at command as follows: "As for language, we can welcome the representatives of Russia, Denmark, France, Sweden, Norway, Germany, Spain and Portugal in pretty stereotype speeches, and give them all information in their mother tongue besides. We also have engineers whose musical Gaelic will entertain the John Thompsons as completely as it could be done on the old sod. We also number United States in our linguistic capacity, and some English, and will furthermore corral our "H's" and suppress smiles if we shall be honored with a visit from any of our English brothers."

The Journey of the "John Bull" to Chicago.

We received last week, too late for publication, a dispatch from the Pennsylvania Railroad's "John Bull" train on its way to Chicago. This dispatch was from Loudonville, O. To that place the train had kept to the schedule, and the officers of the Lines West of Pittsburgh thought that it could have been run at a considerably better speed, notwithstanding a heavy and constant rain. "The old engine had responded with wonderful alacrity to every demand made," and it was expected that it would reach Chicago on time. We are glad to say that this expectation was fulfilled.

The City of the Future.

For some time past France has been considering the problem of providing a suitable central attraction for the great exhibition to be held at Paris in the year 1900. A second Eiffel tower would scarcely accomplish the purpose in view, and the suggested building of a mammoth telescope has already shown itself to be inexpedient. The publishers of the *Inventions Nouvelles* have, however, now made another proposition which is looked upon with favor. It is nothing less than to build a town on the exposition grounds, to accommodate from 3,000 to 5,000 inhabitants, and to practically illustrate the most advanced ideas of construction, heating, ventilating, lighting, water supply, drainage, etc. There are to be real houses, streets, squares, etc., intended for actual use, and the whole property is to be sold after the close of the exhibition. As a matter of course electricity is to play an important part in the design and building of this ideal town. Light and power for the buildings is to be supplied electrically; there are to be electric elevated and surface street railroads; and the sidewalks are to be roofed over with glass as a protection against rain.

Model dwelling houses for workingmen, a model school house, and a model infirmary, are to form part of the town. The prospective high cost of the enterprise is to be made up in great part by the before mentioned sale of the whole outfit after it has served the regular exhibition purpose.

The answer of a Yankee to this proposition would be an invitation to come and see some of the model villages that already exist as features of actual life in America.

The Consumption of Rails.

The *Iron Age* publishes the following table of miles of railroad built and rails produced, imported and used in the years from 1890 to 1892 inclusive. That journal points out that it will be seen from inspection of the table, that the consumption of rails does not fluctuate directly with the activity in railroad building. The rails are reported in gross tons:

Years.	Miles of railroad built.	Production of rails.	Imports of rails.	Approximate consumption of rails.
1870	6,078	553,571	356,387	909,958
1871	7,379	692,619	505,538	1,198,157
1872	5,878	882,857	473,973	1,366,830
1873	4,097	794,711	231,047	1,025,758
1874	2,117	651,261	96,706	747,967
1875	1,711	707,599	17,364	724,963
1876	2,712	785,383	256	785,639
1877	2,280	682,776	31	682,807
1878	2,679	788,111	9	788,120
1879	4,817	993,993	39,417	1,033,410
1880	6,712	1,305,212	259,544	1,564,756
1881	9,847	1,646,518	344,929	1,991,447
1882	11,569	1,507,851	200,113	1,707,964
1883	6,743	1,214,905	34,801	1,249,706
1884	3,924	1,022,088	2,829	1,024,917
1885	2,982	976,978	2,189	979,167
1886	8,018	1,600,537	41,588	1,642,125
1887	12,878	2,139,640	137,829	2,277,469
1888	6,916	1,403,700	56,280	1,459,980
1889	5,146	1,522,204	5,551	1,527,755
1890	5,498	1,885,307	182	1,885,489
1891	4,262	1,307,176	253	1,307,429
1892	4,200	1,500,000*	347	1,500,347*

* Estimated.

Nova Scotia Coal Mines.

The Commissioner of Mines of Nova Scotia has laid before the Nova Scotia legislature his annual report on the coal mines of that province, which, in view of the interest the American syndicate who recently acquired possession of the greater part of the coal areas of Nova Scotia has directed to these mines is deserving of mention. The report showed that the total amount of coal produced in the year 1892 was 1,942,780 tons, while the amount in 1891 was 2,044,784, showing a decrease in 1892 of 102,004 tons. Royalty was collected on the quantity of coal sold and not on the quantity mined. The total sales of coal for the year 1891 were 1,849,945 tons. For 1892 the total sales were 1,752,934 tons, a decrease of the year 1892 of 27,011 tons. This decrease was not confined to mines on the mainland or in Cape Breton, but was shared in by both. The output for the county of Cumberland for the year 1892 was 422,641 tons, and for the county of Pictou 405,457 tons, being a total for the mainland of 828,098 tons. The output for the county of Cape Breton, which was practically the Island of Cape Breton, for the year 1892 was 923,869 tons, being a difference in favor of Cape Breton for the year of 95,771 tons. Many years ago the production of the Island of Cape Breton was almost the whole of the production of the province, but now it is seen that the difference between the production of the island and that of the mainland is not very great. The coal sold in Canada, including the bunker coal sold in Halifax and supplied to steamers, was, in 1891, 639 737 tons and for 1892, 623,978 tons; being a decrease in 1892 of 15,759 tons. The home sales were a little over one-third of the total quantity of coal sold. There was one item of increase. This was in the manufacture of coke. In the year 1892 55,000 tons were manufactured compared with 34,148 tons in 1891.

New York Terminal Station of the New York and Brooklyn Bridge.

The reconstructed New York Station will be located on the southerly side of Park Row and its site includes that of the existing New York Station. It has direct connection with the City Hall Station of the Third Avenue Elevated Railroad, and also by an elevated passage way and stairways with the northerly side of Centre street, and by stairways with William and Rose streets.

In plan, the reconstructed station is rectangular, 580 ft. long and 87 ft. wide; continuing from the southerly end is a short, elevated, uncovered structure, over which the tracks enter the station. There are two main floors: the first or ground floor on which are retiring rooms and three ticket booths, and the second floor on which, placed longitudinally, are two passenger platforms and four tracks. Between these floors and leading back from Park Row about 140 ft. is an intermediate floor, a continuation of the elevated passage way over Park Row and Centre street. From the first to the second floor are six stairways, and from the first to the intermediate floor are two ramps and one stairway; also from the first floor to the sidewalk at Rose street are two stairways each inclosing an elevator, and to the sidewalk at William street is one stairway. The ticket booths on the first floor are near the entrances to the stairways leading to the outgoing passenger platforms.

The outer walls are to be of brick and of cast or wrought metal. The intermediate and second floors are of brick or terra-cotta, arched between the girders and beams and with openings in which floor lights are inserted: the floors are surfaced with concrete or wood; and the roofs are of wood, on iron or steel purlins, covered with sheet metal or slate and glass.

A part of the site of the reconstructed station nearest Park Row is occupied by the existing New York Station, which is to be removed as the reconstruction proceeds. During the erection and completion of the reconstructed station, the use and operation of the bridge, and of the connection with the City Hall Station of the Third Avenue Elevated Railroad, are to be continued without interruption or delay.

Railroad Engineering at the Rensselaer Polytechnic Institute.

While the principal purpose of the Institute is to soundly teach the theory which underlies the general practice of engineering, rather than to attempt to give the student actual practice in any one department, and while we believe that this should be the aim of every true engineering school, we are, nevertheless, very glad to note the combined method of theory and practice which is to be employed this year in the course in railroading. The subject of railroading, because it is involved with so much exploration and work in the field, is one which is essentially practical, and which cannot, therefore, be properly taught without giving the student abundant opportunity to engage in these field operations. On the other hand, there are certain fundamental, underlying laws on which all proper economic location of railroads is based, and the railroad engineer who is properly educated for his work cannot afford to be without a knowledge of these laws. Study of this kind, together with the pure mathematics of railroad curves, belongs properly to the work of the class-room, and as such is being discussed; and in order that the student may see the practical application of his class-room theories, it is intended that he shall have an opportunity to make the reconnaissance, preliminary survey and location of an actual piece of road.—*The Polytechnic.*

Artificial Stone.

A new kind of artificial stone, called "bitumelith," was recently described before the Berlin Architects' Society. It is said to be specially applicable to plastic work of all kinds and to admit of being used much like plaster of Paris. After a period of about 14 days the material is claimed to assume a degree of hardness and strength superior to Portland cement, and in that condition may be worked like natural stone. It is said not to crack, to be impermeable to water and unaffected by acids, and is recommended as a good material for floors, stair treads, columns, wall coverings, etc. Its cost, further, is said to be moderate.

A Professorship of Civil Engineering.

The Board of Regents of the University of Texas have allowed Professor Taylor a leave of absence for 1893-4. A Professor of Civil Engineering (including mechanical drawing), *ad interim*, will be elected in June, 1893. The position, it must be understood, is for only one year. The salary will be at least $200 per month for nine months. Applications should be addressed to Col. F. W. Ball, Fort Worth, Tex. Information in regard to the work can be obtained from Dr. Leslie Waggener, Chairman of the Faculty, or from Professor Taylor, both of Austin, Tex.

Mexican Railroad Statistics.

In a report prepared by the order of the Mexican Government, the following facts regarding the railroads of that country are given: In 1880 there were 19 railroads in the Republic, with a length of 1,055 kilometres. In 1892 there were 89 roads with a length of 10,558 kilometres. In both cases only railroads built under Federal concessions are counted.

The following table gives the total length of railroad lines of all kinds in Mexico in 1892.

Railroads built by Federal concession	10,557 kil.	986 m.
City railroads	354	100
Suburban railroads	185	296
Private railroads	71	
Railroads of the Decauville system	230	252
Total	11,397 kil.	634 m.

In the following table a comparison of the traffic of the roads in the year 1880 is made with that of 1890.

	Passengers.	Freight.	Earnings.
1880	9,699,982	364,398	$6,317,908
1890	19,531,695	2,734,430	21,019,961
Increase	9,831,713	2,370,032	$14,702,053

Coal in Asiatic Russia.

Notwithstanding the existence of rich coal deposits in Siberia the output is insignificent, for the simple reason that there is little or no market for it. In the Tomsk district, for example, in which there are most promising outcroppings of anthracite coal of the best quality, and where it could be mined with little difficulty, the total yearly output, according to the journal *Glückauf*, is only 750,000 poods, or about 13,500 tons. In view of the fact, however, that there are in the same neighborhood extensive iron ore deposits and that the coal is of a good coking quality, it is thought that considerable development will take place in the near future.

The Welland Canal Opened.

The Welland Canal was opened on April 24.

Railroad Legislation in Minnesota.

The legal departments of the railroads are engaged in sizing up the legislation of the late session so far as it affects their interests. The roads entitled to state swamp lands, chiefly the Great Northern, St. Paul & Duluth and Duluth & Iron Range, are troubled most by the law, which limits to two years the time for selection of lands, and which provides that if they do not select within that time the state is to select for them; then, after all grants are filled in that manner all remaining lands are to be forfeited to the state. The land departments have no idea that they can select the lands within the limit of time, which is still further reduced by a provision in the law that if there are not sufficient lands now to fill the quotas—as there are not—they can have but one year from the date of new certificates of patents in which to file on the additional lands patented.

The two most drastic measures are the Jacobson law, under which the location of warehouses and elevators on railroad rights of way can be ordered by condemnation proceedings when the persons desiring to locate cannot reach an agreement with the railroad company; and the companion bill to compel the construction of side tracks. Under the latter, if no flaw can be found, and none appears as yet, the companies can be compelled to build side tracks and operate lines from any right of way near to any regular station, to any elevator of 5,000 bushels capacity, or to a mill or factory located on ground adjacent to the right of way; and if the parties cannot agree, the State Railroad Commissioners have authority to act.

Other measures are such as requiring street crossings in cities and villages to be graded or planked the full width of the graded street; Smith's pet law—affecting the Northern Pacific especially—prohibiting the abandonment of any road, except by decree of the district court; requiring all passenger trains to stop at county seats, except transcontinental and interstate trains, which lets out the road aimed at (St. Paul & Duluth); requiring platforms and appliances for handling heavy machinery put in at all places of over 250 inhabitants.

The single important offset for this is the anti-scalper law, which is received with great satisfaction by the strong companies, but by the so-called "guerilla" lines it does not seem to be relished much more than by the scalpers.—*St. Paul Dispatch, April* 21.

LOCOMOTIVE BUILDING.

The Richmond Locomotive & Machine Works has orders on hand for 34 locomotives.

The Baldwin Locomotive Works are building four engines for the New Orleans & North Eastern road.

The Boston & Albany has placed orders for 10 consolidation engines with the Schenectady Locomotive Works.

The Roanoke Machine Works has received an order from the Norfolk & Western for the construction of 18 locomotives.

The Chicago Great Western, which was reported three weeks ago as in the market for engines, has asked bids for building 25 freight and passenger locomotives.

The Illinois Central will soon contract for 48 locomotives. Of these engines 26 will be of the mogul type, seven will be eight-wheel passenger engines, and 15 will be six-wheel switching engines.

The Cincinnati, Hamilton & Dayton has let orders for building six freight and two switching engines to the Brooks Locomotive Works, and for six freight engines to the Pittsburgh Locomotive Works.

The Minneapolis, St. Paul & Sault Ste. Marie has recently let contracts for 15 ten-wheel compound locomotives, dividing the order between the Rhode Island Locomotive Works and the Schenectady Locomotive Works.

CAR BUILDING.

The South Baltimore Car Works has closed a contract with the Boston & Albany Railroad to build 700 box cars.

The Missouri Car & Foundry Company has an order for 1,000 box cars for the Cincinnati, New Orleans & Texas Pacific.

The Jackson & Sharp Company, of Wilmington, Del., has recently received an order for 50 narrow gauge freight cars for export to the United States of Colombia.

The Harrisburg Car Manufacturing Company commenced work last week upon an order for 300 cars. The company is now bidding on a contract for 200 cars for an Eastern road.

BRIDGE BUILDING.

Akron, Ia.—The board of supervisors has under consideration the building of a new bridge over the Sioux River to replace one recently destroyed by storms. The bridge will be built if Union County, S. D., will bear part of the expense.

Chester, W. Va.—A charter was issued this week to the East Liverpool Bridge Co. to construct a bridge across the Ohio River, near Chester, Hancock County, W. Va. The incorporators are C. P. Dorr, of Addison, W. Va.; Alfred Paull, of Wheeling, W. Va. J. B. McDonald and F. H. Croxall, East Liverpool, O.; E. R. Curtis, Luray, Va.

Cleveland, O.—The Cleveland Bridge Co. was chartered in Ohio this week, the incorporators being J. M. Henderson, Virgil P. Kline, S. H. Tolles, F. A. Quail and C. H. Gale.

Dauphin, Pa.—A new stone-arch bridge will replace the old wooden structure across Clark's Creek one mile north of Dauphin, Pa., on the line of the Schuylkill Division of the Northern Central. Temporary trestling has been erected, over which trains are being run while the work is progressing.

Delphi, Ind.—The County Commissioners have let the contracts for a bridge across Deer Creek and another across the Wabash, both at Delphi. The former is for a 134-ft. span and the latter for three spans, each 200 ft.

The contracts were awarded to the Layayette Bridge Company for $26,000.

Ellicott City.—The Elkridge Bridge Company, of Howard County, Md., was chartered last week. The object is to build a bridge over the Patapsco River between Howard and Baltimore counties from a point near Avalon.

Moundsville, W. Va.—The County Court of Marshall County, W. Va., has made an order for the erection of a steel highway bridge over Big Grave Creek at Rosby's Rock, in that county. Bids will be asked about May 1.

Norristown, Pa.—Bridges are to be erected as follows in Montgomery County this spring and summer: One over Poquessing Creek in Moreland; one over Huntingdon Creek in the same township; one over the west branch of the Neshaminy in Hatfield Township near the village of that name; one over the east branch of the Perkiomen in Lower Salford. Plans and specifications are now being prepared.

Piedmont, W. Va.—Preliminary surveys have been made for the proposed new highway bridge over the North Branch of the Potomac River from Fairview street, Piedmont, to Luke, Md. It will take three spans as follows: One of 130 ft. over the tracks of the Baltimore & Ohio, a main span over the channel of the river 168 ft. long, and one 112 ft. long at Luke, making the total length of the structure 410 ft. The cost has not been carefully estimated, but it is thought that about $15,000 will be expended in the enterprise.

Radford, Va.—The American Bridge Company, of Roanoke, has been awarded the contract for the construction of a bridge at Radford to cost $25,000.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulations of Railroads.

The Supreme Court of Illinois rules that a railroad located in a street may be specially taxed to pay for the improvement of the street.[1]

In New York it is held that the provision of the Law of 1880 that in estimating the benefit from paving a street along which a railroad runs "the company owning the railroad shall be estimated to be benefited by such paving . . . in such proportion as its tracks . . . may bear to the width of the whole street, and shall be assessed for such work proportionately thereto," is valid, since the legislature has authority to determine that a railroad company in a street shall bear a part of the expense of paving the street, and the amount of such part is in its discretion, and is not subject to the objection that it discriminates against a particular class of property.[2]

The Federal Court holds that a constitutional provision that no foreign corporation shall "have power to condemn or appropriate property," does not prevent a foreign railroad company from acquiring land by agreement with any citizen having a right to contract.[3]

A statute of North Carolina incorporating the W. & W. R. Co. provided in Section 19 that such road should be free from taxation. Subsequent sections authorized the construction of branches, and provided that all powers, rights and privileges conferred by preceding sections in respect of the main road should extend thereto, in the laying out, construction, use and preservation of said branches. The Supreme Court of the United States holds that the privileges extended to the branches were limited to the purposes enumerated, and did not exempt the branch lines from taxation. By a subsequent act the H. & W. R. Co., which had not been exempt from taxation, was absorbed into the W. & W. R. Co., its stockholders taking W. & W. stock in lieu of their own, and it was provided that the property of the absorbed road should be held in the same manner as all other property of the absorbing road. The court decides that the absorbed road was not exempt from taxation.[4]

The charter of the Roanoke Railroad Company provides that its property shall be vested in the stockholders in proportion to their shares, shall be deemed personal estate, and shall be exempt from any tax for 15 years; and thereafter the legislature may impose a tax not exceeding 25 cents per annum on each share of the stock whenever the annual profits shall exceed six per cent. A law of 1891 imposed on the successor of the original company a tax of 20 cents per annum on each share of stock for the years from 1862 to 1892, inclusive. The Federal Court rules that such tax was not a property tax, but was a price charged under the charter contract for the franchise, and was collectable from the company, and not from the stockholders.[5]

In Mississippi it is held by the Supreme Court that where a statute provides that an excess of six miles per hour within the city limits is an unlawful rate of speed for railroad trains, it does not follow that a less rate is lawful at all times and places; but in such a case negligence must be determined by the circumstances of each occasion.[6]

In the Federal Court an order appointing a receiver authorizes him to pay out of income, besides the current expenses and charges, all wages due to employés at the date of the order for services within 90 days theretofore. The Court rules that a lawyer employed at a fixed salary per month came within the terms of the order.[7]

Injuries to Passengers, Employes and Strangers.

In Missouri it appeared that deceased was a section hand on defendant's railroad, and that, as a train approached where he was working, he stood back 4 to 6 ft. from the track, but was picked up after the train had passed with a deep wound in his head, evidently not received while on the track. The train passed at full speed, but the engineer whistled 150 yards from where deceased was working. The Supreme Court holds that there was no evidence of negligence on the part of the engineer.[8]

In the same state the Supreme Court rules that a recovery for the death of a fireman caused by the collision of his train with cars which ran down a grade owing to the failure of a fellow-servant to set the brakes, cannot be based on the ground that the train to which the cars belonged was insufficiently manned, when its crew consisted of the usual number and was sufficient for all ordinary occasions.[9]

In New York the plaintiff was arrested by an officer without a warrant for wilfully obstructing defendant's cars, and taken before a magistrate, who cautioned and discharged him. The next day he was rearrested, taken before the same magistrate, adjudged guilty, and sentenced to pay a fine of $10 or be imprisoned 10 days. Plaintiff paid the fine, was discharged from custody and, in an action for false imprisonment, testified that the first arrest was on the direct request of defendant's timekeeper, which testimony the officer corroborated, and that the second arrest was on the complaint of defendant's roadmaster, which was uncontroverted. The Court rules that the acts of the railroad company's servants in causing the arrest, though tortious, were committed within the scope of their authority, and rendered the company liable as tort feasor for the damage caused by the wrongful arrest, jointly with the officer making it, or severally, at plaintiff's election.[10]

In Missouri the Supreme Court rules that the proximate cause of the death of a fireman on a train which collided with cars of a train in front of it being the failure of a fellow-servant on the front train to set the brakes and so prevent the cars from running down grade, recovery cannot be had from the railroad company on the ground of negligence in running the rear train ahead of time without notice to the conductor of the forward train, when it appears that it was not usual or necessary to give such notice, and the trains were not running on the same schedule.[11]

In New York it is held that where a railroad, without a license from the city, allows water to flow from its tank upon the sidewalk of a street where it freezes, the company is liable to persons who are injured by falling on the ice.[12]

The Supreme Court of Missouri rules that where a railroad company's section foreman, under whom plaintiff was employed, directed a water keg to be placed on the front end of a hand car for his seat, and while the car was in motion got up and allowed the keg to fall off, thus causing the car to leave the track and injure the plaintiff, the injury was from the negligence of the foreman, for which defendant is liable.[13]

In Missouri the Supreme Court lays it down that the rule requiring a person who goes on a railroad track, or proposes to cross it, to use his eyes and his ears to avoid injury; and providing that, if he fails to do so and is injured, he cannot recover, notwithstanding the negligence of the railroad company—is not of universal application, but has exceptions under exceptional circumstances. And the railroad was held liable for injuries received at a street crossing on the following state of facts: that the street was crossed north and south by 30 tracks; that the railroad failed to have gates either side of the tracks, and two watchmen, and brakemen on its cars, and to ring the engine bell, at the time of the injury, as required by ordinance of the city; that plaintiff was familiar with the crossing; that a train of freight cars extending partly into and south from the crossing stood on the first track west of the double main tracks, which are located within seven tracks of the west side of the yard; that when walking west, before reaching the main tracks, plaintiff saw an express train coming south; that he crossed the main tracks, and looked south; that he saw the smoke of an engine, but saw no one on top of any cars, and heard no bell; that he saw that the crossing west was open; that while walking westward, and watching the express train, he was struck by cars moving north on the third track west of the main tracks, which had been "kicked" by an engine from a point some 350 yards from the crossing; that, after plaintiff passed the train of freight cars, he did not look south, and that, if he had looked south, he could have seen the cars by which he was struck in time to avoid the injury.[14]

In Wisconsin it is held by the Supreme Court that the fact that the noise made by a sawmill, running near a railroad track, interfered with the hearing of a person walking thereon, increased his obligation to look for approaching trains.[15]

A statute of Massachusetts requires that a person not a passenger, to recover damages for injuries must be "in the exercise of due diligence." Plaintiff's intestate, who was about 73 years old, and in good health, except for a slight lameness, lived 30 rods from the crossing, and all the way from her house to the crossing the track was visible in the direction from which the train came for the distance of a quarter of a mile. She walked from her house onto the crossing without looking to see if any train was coming, and was there struck and killed. The company is held not liable.[16]

The New York law of 1850 providing that a bell or whistle should be placed on all locomotives and sounded in a certain manner, under a penalty upon the railroad company for neglect to comply therewith, and the law of 1854 providing that, in addition to the penalties imposed on the company, every engineer in charge of an engine who disobeyed the statute was to be guilty of a misdemeanor, were repealed in 1886 by a law which provides that the engineer who fails to ring the bell or sound the whistle of a locomotive 80 rods before crossing a highway should be guilty of a misdemeanor. The Court of Appeals hold that this section imposes the duty of giving such signals solely on the engineer, and his failure to give them is not negligence in law on the part of the company. Maynard J., dissenting.[17]

[1] Kuehner v. City of Freeport, 32 N. E. Rep., 372.
[2] L. S. & M. S. v. City of Dunkirk, 20 N. Y. S., 596.
[3] St. L. & S. F. v. Foltz, 52 Fed. Rep., 627.
[4] Wilmington & W. R. Co. v. Alsbrook, 13 S. Ct., 72.
[5] State v. Seaboard & R., 52 Fed. Rep., 450.
[6] A. & V. v. Phillips, 11 South Rep., 602.
[7] Finance Co. of Penn. v. C. C. & C. R. Co., 52 Fed. Rep., 526.
[8] Ring. v. Mo. Pac. Ry. Co., 20 S. W. Rep., 436.
[9] Relyea v. K. C., Ft. S. & G. R. Co., 20 S. W. Rep., 480.
[10] Kolzem v. B. S. A. R Co., 20 N. Y. S., 700.
[11] Relyea v. K. C., Ft. S. & G. R. Co., 20 S. W. Rep., 480.
[12] McGoldrick v. N. Y. C. & H. R., 20 N. Y. S., 362.
[13] Russ v. Wabash, W. Ry. Co., 20 S. W. Rep., 472.
[14] Jennings v. St. L., I. M. & S. R. Co., 20 S. W. Ref., 490.
[15] Schmolze v. C., M. & St. P. Ry. Co., 53 N. W. Rep., 743.
[16] Tyler v. Old Colony Ry. Co., 32 N. E. Rep., 227.
[17] Vandewater v. N. Y. & N. E., 32 N. E. Rep., 636.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Baltimore & Ohio, semi-annual, 2½ per cent. on the common stock, payable May 17.

Cincinnati, Hamilton & Dayton, quarterly, 1¼ per cent. on the common stock, payable May 1.

Cincinnati, Sandusky & Cleveland, semi-annual, 3 per cent., payable May 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 23.

Canadian Pacific, special, Montreal, Que., May 10.

Central of New Jersey, annual, Jersey City, N. J., May 5.

Chesapeake & Ohio Southwestern, special, Memphis, Tenn., June 13, to approve of the purchase of the Hodgeneville & Elizabethtown.

Chicago Burlington & Quincy, annual, Chicago, May 17.

Chicago & Northwestern, annual, Chicago, Ill., June 1.

Chicago, St. Paul, Minneapolis & Omaha, annual, Hudson, Wis., June 3.

Cincinnati, Jackson & Mackinaw, annual, Toledo, O., May 1.

Cleveland, Cincinnati, Chicago & St. Louis, special, Cincinnati, O., May 10.

Columbia & Port Deposit, annual, Philadelphia, May 1.

Delaware & Hudson Canal, annual, New York City, May 9.

Eastern of New Hampshire, annual, Portsmouth, N. H., May 2.

Kansas City & Omaha, annual, Fairfield, Neb., May 2.

Lake Shore & Michigan Southern, annual, Cleveland, O., May 3.

Lewisburg & Tyrone, annual, Philadelphia, Pa., May 1.

Louisiania & Missouri River, annual, St. Louis, Mo., May 3.

Mexican Central, annual, Boston, Mass., May 3.

Michigan Central, annual, Detroit, Mich., May 4.

Missouri, Kansas & Texas, annual, Parsons, Kan., May 17.

Mobile & Ohio, special, Mobile, Ala., May 29.

New York, Chicago & St. Louis, annual, Cleveland, May 3.

New York & Harlem, annual, New York City, May 16.

Norfolk & Western, annual, Roanoke, Va., May 3.

Omaha & St. Louis, annual, Stanberry, Mo., May 16.

Pittsburgh, Fort Wayne & Chicago, annual, Pittsburgh, Pa., May 17.

Pittsburgh, Virginia & Charleston, annual, Philadelphia, May 2.

Pomeroy & Newark, annual, Philadelphia, May 1.

St. Louis, Alton & Terre Haute, annual, St. Louis, Mo., June 5.

Southern Pennsylvania Railway & Mining Co., annual, Philadelphia, May 1.

Wyoming & Utah, annual, 28 School street, Boston, Mass., May 11.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Association of American Railway Accounting Officers* will hold its fifth annual meeting at the Auditorium Hotel, Chicago, commencing May 31.

The *Railway Agents' Association of North America* will meet at Old Point Comfort, Va., on Tuesday, May 16.

The *Western Railway Club* meets at the rooms of the Central Traffic Association in the Rookery Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7.30 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel St. Paul, on the second Tuesday of each month, except during June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The Association of Engineers of Virginia holds informal meetings the third Wednesday of each month, from Septemcer to May inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers held on Wednesday evening, April 19, a paper on "The Old-Time Water Wheels of America," by Joseph P. Frizell, was presented. Mr. Frizell stated that this paper was written with the expectation that it would awaken the recollections of other engineers upon the subject, and in that way add to the rather meagre fund of information now possessed.

Both the overshot and breast wheels were given a speed above that shown to be most economical. In the undershot wheel the floats were radial, and moved with a velocity of about two-thirds that due to the head of water. These wheels were never geared to more than two pairs or runs of millstones. The velocity of the stones at the circumference was about 1,500 ft. per minute. The bearings of the horizontal shafts were of

stone, which were selected so as to be "hard and free from grit." The power was usually transmitted by spur gear.

The breast wheel began to be replaced by turbines in about 1845. The latest form of the breast wheel was of great length, reaching to over 20 ft. It had four sets of arms and shroudings, the latter at one end bearing the toothed ring which transmitted the power. The water was admitted by horizontal sliding gates.

Mr. T. C. Clarke stated in discussion that the reason why the modern turbine had taken the place of all these old wooden wheels is that this is the age of iron and has superseded the age of wood; with the facilities of those days it would have been impossible to have produced the modern turbine.

Mr. Joseph T. Dodge spoke of a wheel he remembered which was used to run the carriage back in a saw mill. This wheel had cast iron curb buckets supported by an inner and an outer rim. The spout conveyed the water down at an angle of 45 deg., striking the curb baskets at as nearly a right angle as possible. This wheel was in use between 1830 and 1840.

A second paper on "Notes on Cost of Operating Cable Railroads," by D. Bontecou, was also read. An abstract of this paper and of the discussion is given on another page.

The Board of Direction has appointed a Committee of Information and Courtesy, consisting of Messrs. Edward P. North, L. L. Buck and Foster Crowell, with headquarters at the Society House, to extend to visiting engineers during the Columbian Exposition information and guidance to enable them to gain convenient access to works and objects of engineering interest throughout this country. The Committee asks help in this effort by information as to works of either engineering or manufacturing interest, offers of facilities to visitors, who may go properly accredited from time to time during the continuance of the Exposition. The Committee has been constituted on the most economical basis consistent with the object, and in order to carry out the plan must rely largely on the voluntary services of members of the Society on the lines above indicated. Members who are willing to co-operate are asked to address Committee on Information and Courtesy, American Society of Civil Engineers, 127 East Twenty-third street, New York, giving information in detail, and stating at the same time what foreign language they may personally have at command.

Boston Society of Civil Engineers.

The regular monthly meeting of the Society was held at Wesleyan Hall, Boston, on Wednesday, April 19, 1893, President John R. Freeman in the chair and over 100 members and visitors present. George F. Hardy, of Holyoke, Mass., and Francis H. Kendall, of Belmont, Mass., were elected to membership. The literary exercises of the meeting consisted of a very interesting address by Mr. George S. Morison, of Chicago, on Bridging Western Rivers. Mr. Morison described some of the difficulties experienced in securing foundations for bridges in the Ohio, Missouri and Mississippi rivers, and spoke of the peculiar characteristics of each of these rivers.

He gave some very interesting details of one of the latest bridges built by him, that across the Mississippi river at Memphis, and showed on the screen a large number of lantern views illustrating his address.

PERSONAL.

—Mr. J. F. Babbitt, Jr., who recently resigned as Purchasing Agent of the Central of Georgia, is now engaged in introducing the Wadley continuous drawbar.

—Mr. J. T. R. McKay, General Freight Agent of the Lake Shore & Michigan Southern, after an absence of 14 months on account of ill health, has returned much improved, and again assumed the duties of his position.

—General Passenger Agent W. B. Shattuc, of the Ohio & Mississippi, has accepted the appointment of Agent Commissioner of the new Cincinnati & St. Louis Passenger Traffic Association. He will assume his new duties on May 1.

—Major A. H. Swanson has been elected Manager of the new Texas Car Service Association. Major Swanson was formerly Transportation Manager of the Houston & Texas Central, and was recently one of the joint receivers of the St. Louis, Arkansas & Texas road.

—Mr. J. S. Barbour Thompson, Superintendent of the Richmond & Danville Railroad, who has been an invalid for some months past, is improving, and it is thought that he will be able to resume his railroad duties at an early date. He is still in New York, where he has been since December, under medical treatment.

—Mr. E. P. Cutter has resigned the offices of Auditor and Secretary of the Ohio & Mississippi, the change being incidental to the arrangements now perfected for the absorption of the Ohio & Mississippi by the Baltimore & Ohio Southwestern, under which the various departments are to be combined under the officials of the latter company.

—Mr. A. A. Robinson, who recently resigned the office of Second Vice-President and General Manager of the Atchison, Topeka & Santa Fe, was elected President of the Mexican Central on April 21. He will have his office in the City of Mexico. President S. W. Reynolds remains in charge of the financial affairs of the company in Boston under another title than president, the duties of the office practically being divided.

—At a meeting of the Board of Managers of the Lehigh Coal & Navigation Co. this week, Mr. Joseph S. Harris, President-elect of the Philadelphia & Reading Railroad and Coal & Iron companies, resigned the position of President, and was elected a manager of the company. Mr. Edward B. Leisenring resigned the position of Manager and was elected President, to succeed Mr. Harris. The changes will take effect on May 1.

—Mr. C. C. Midwood, Assistant Secretary of the Philadelphia & Reading and Secretary of several of the branch lines, has tendered his resignation. Mr. Midwood's connection with the Reading dates back to 1886, when Mr. McLeod became General Manager of the road. He served as private secretary to Mr. McLeod during the earlier part of his term as General Manager, and in 1891 was made Assistant Secretary. He will now go with President McLeod to the Boston & Maine Railroad.

—Mr. E. P. Lord, formerly Superintendent of Motive Power of the Cleveland, Cincinnati, Chicago & St. Louis, and before that Mechanical Engineer of the Fort Wayne Division of the Pennsylvania lines west of Pittsburgh, has accepted a position with the H. K. Porter Company, Pittsburgh, as General Manager in charge of construction. Mr. Lord's ability as a mechanical engineer is well known, and his acceptance of a position with the Porter Company promises well for that concern.

—Mr. W. R. Babcock has been appointed General Passenger Agent of the New York & New England, vice A. C. Kendall, resigned to accept the general passenger agency of the Old Colony system. Mr. Babcock is now the Southern Passenger Agent of the Central Vermont Railroad, as well as Travelling Passenger Agent of the New York & Northern and the N. Y. & N. E. R. R. in New York, and was formerly General Western Passenger Agent of the New York & New England, with office in New York. Before that he was assistant General Passenger Agent of the Providence & Stonington Steamship Co.

—Mr. Edward Young, attorney for the Delaware & Hudson Canal Company, died in Albany, April 21, from injuries received by being thrown from his horse. Mr. Young did not regain consciousness after the accident. He was born in Honesdale, Pa., 37 years ago, the son of Col. F. Young. Mr. Horace G. Young, Vice-President of the Delaware & Hudson Canal Co., is a brother. Mr. Edward Young became the attorney of the Delaware & Hudson Canal Co. in 1880, and continued to hold that position until his death. He was executor of the estate of the late Thomas Cornell, of Rondout, and President of the Ulster & Delaware road, and other corporations controlled by the state.

ELECTIONS AND APPOINTMENTS.

Central of Georgia.—Maurice A. Powers has been appointed Superintendent of Terminals of the road at Savannah. Mr. Powers is private secretary to General Manager Odell, of the Baltimore & Ohio.

Colorado Midland.—J. W. Waters has been appointed Acting General Freight Agent of the road in place of E. A. Collbran, deceased.

Cumberland.—At a meeting of the stockholders of this company held April 17, the following directors were elected: C. Wood Daily, Thomas Davis, Asa Wilson, James A. Milholland, Hopewell Hebb and E. W. S. Moore. Mr. C. Wood Daily was elected President. The proposed traffic agreements with the West Virginia Central & Pittsburgh road were ratified.

Elgin, Joliet & Eastern.—The announcement published in these columns on April 7 that H. T. Hawley, late Assistant Superintendent of the Chicago & Alton, had been appointed to a similar position on the above road, was erroneous.

Lake Providence & Western.—Directors were elected at Lake Providence, La., last week by the stockholders of this projected road, as follows: W. G. Wyly, C. Mahe, P. McGuire, N. Murfee, C. S. Wyly, J. N. Turner, J. E. Ransdall, J. Hamley and J. L. Davis, of Lake Providence.

Mexican Southern.—As previously announced, this road was turned over to the company by the contractors on April 1. The officers are as follows: Pablo Martinez del Rio, Attorney and Government Representative; G. M. Stewart, Local Director, City of Mexico; Walter Morcom, General Manager; H. Pratts, Chief Engineer; C. W. Carnegy, Auditor, and Nicolas Martinez del Rio, Secretary.

Minneapolis, St. Paul & Buffalo Steamship Co.—H. A. Kennedy has been appointed New England Agent for this company, with office at No. 197 Washington street, Boston, vice H. G. Leslie, resigned.

New Orleans & Northwestern.—The stockholders held their annual meeting in Natchez, Miss., April 17, and elected the following directors: C. H. Hammett, T. E. Morrison, Chas. Hyde, A. H. Foster, L. K. Hyde, A. C. Craney, F. DeL. Hyde, James W. Lambert and E. S. Drake. The Board of Directors organized by electing these officers: President, C. H. Hammett; Vice-Presidents: T. E. Morrison, F. DeL. Hyde and A. C. Craney; Secretary, James W. Lambert; Treasurer, Charles Hyde.

Pine Bluff & Eastern.—A. T. Martin, formerly a passenger conductor, succeeds A. V. Stafford, as General Manager of this road, with headquarters at Pine Bluff, Ark. The changes take effect May 1.

Portland, Monterey & Gulf.—The incorporators named in the charter filed in Texas last week are: John Willacy, V. H. Henderson, A. B. Hall, W. S. Dunlap, J. C. Atkins, J. S. Little, A. Marrow, O. S. Rieffe, J. O. Bell, J. E. Little, M. S. Gaines, and W. C. Lewis, all of San Patricio County and Arkansaw.

St. Louis, Chicago & St. Paul.—Isaac W. Fowler has been appointed General Superintendent of this company with full power and authority to manage, control and direct the same in all its branches, including the construction work now going forward.

St. Louis Southwestern.—The following changes are announced, effective on May 1: S. G. Warner, District Passenger Agent at Memphis, will succeed W. H. Winfield, as General Passenger Agent of the lines in Texas; F. Jones, Traveling Passenger Agent at Fort Worth, Tex., will succeed Warner as District Passenger Agent at Memphis, Tenn.

Staten Island Rapid Transit.—The annual meeting of the stockholders on April 25 resulted in the election of the following directors: Charles F. Mayer, Thomas Nuting, Orland Smith, C. K. Lord, Frank S. Gannon, C. J. Ryan, W. G. Atkinson, J. Frank Emmons, A. B. Boardman, James M. Davis and Louis de Jonge, Jr.

Toledo, Ann Arbor & North Michigan.—The annual meeting of the railroad was held in Toledo April 20. The following directors were elected: J. M. Ashley, A. W. Wright, Henry W. Arpley, Joseph Walker, Jr., William Baker, David Robison, Jr., T. W. Childs, J. M. Ashley, Jr., H. B. Livingston, T. W. Whitney and S. Dean. The old officers were re-elected.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Anniston Belt.—The belt line at Anniston, Ala., connecting the Woodstock Iron Co.'s furnaces and the Radford Pipe Works with the East Tennessee, Virginia & Georgia Railroad, has been completed.

Black Hills Central.—Construction work on the railroad has been resumed at Rapid City, S. D., by a large force of men, and it is stated that the road will be pushed to completion as fast as possible. The line now under construction extends from Rapid City west up Rapid Creek, through the Black Hills to the Wyoming coal field, lying west of the South Dakota State line. It is announced that the road will soon be started east from Rapid City toward Pierre, traversing a portion of the Sioux reservation thrown open for settlement a few years ago.

Canadian Pacific.—The line from Fort MacLeod, Can., the southern terminus of the Calgary & Edmonton branch, west through Crow's Nest Pass, is reported to be nearly all graded, and it is said that the company will complete the gap between MacLeod and Lethbridge, the western terminus of the Alberta Railroad, now operated by the Canadian Pacific, during the early summer.

Chattanooga & Western.—A charter for this company was filed in the office of the Secretary of State, at Nashville, Tenn., last week. No particulars of the route are given in the newspaper reports.

Chicago, Rock Island & Pacific.—The road from Lincoln southwest to Jansen, Neb., 54 miles, will be opened for business on May 7. Stations will be opened at the following towns: Rokeby, Martell, Hallam, Clatonia, DeWitt, Plymouth and Jansen. The new line gives a shorter connection from Omaha and Lincoln to the Colorado division of the road than the present route via Beatrice.

The negotiations pending for securing the right of way into Fort Worth, Tex., have been consummated. Contracts are let for grading part of the road south from Bowie, Tex., and the remainder of the line will soon be under contract. Tracklaying will be commenced at once at Bowie.

Chicago & South Side Rapid Transit.—On April 23 this road opened for traffic that part of its line from Sixty-first street south to Sixty-third street, Chicago, and east on Sixty-third street to Madison avenue. It is expected that by April 26 the trains will be running into the Fair grounds, as all that delays them from doing so now is the unfinished condition of the station over the Annex to the Transportation Building. The stations at Cottage Grove avenue and Madison avenue were opened on April 23 and before May 1 several others will be open.

Cleveland, Wooster & Muskingum.—Engineering parties are engaged in surveying a line into Cleveland via Medina, and the men are variously reported to be working for the Cleveland, Lorain & Wheeling and the above road. The latter is a branch of the Baltimore & Ohio, and the extension from Lodi, O., northeast to Cleveland, 35 miles, has been partly surveyed before.

Crystal River.—The lines now being built by this company are as follows: Beginning at Carbondale, Col. (a station on the Denver & Rio Grande), and extending in a southerly direction up the Crystal River to the mouth of Coal Creek, a distance of 17 miles; thence westerly up Coal Creek to its head, a distance of 12 miles. There are no towns of any account on the road. In addition to the above lines it is expected to build from Coal Creek up the Crystal River to Crystal, a distance of 22 miles. The upper 12 miles of the road are graded and about three-fourths of the lower 17 miles. The track will probably be laid on the first 17 miles by May 15 and on the upper 12 miles by July 1. The tracklaying is being done by the company. The contract for the grading has been let to Orman & Crook, of Pueblo, Col. Of the 29 miles now building 25 miles are graded, leaving four miles unfinished, and about eight miles of track has been laid since Jan. 1. On the main line from Carbonuale to Coal Creek the road is standard gauge; maximum grades, 104 ft. to the mile; maximum curves, 20 deg. From the mouth of Coal Creek to its head the gauge is 3 ft.; maximum grades, 211 ft. to the mile; maximum curves, 60 deg. The bridging is not important, a few girders, with from 34 to 60-ft. spans, comprising all of this work. The road is being built to reach the mines of the Colorado Fuel & Iron Co. The officers are: J. C. Osgood, President, No. 18 Broadway, New York; J. A. Kebler, Vice-President and General Manager, Denver, Col.; D. C. Beaman, Denver, Secretary; T. H. Wigglesworth, Chief Engineer, Carbondale, Col.

Dallas & Fort Worth.—The local papers at Fort Worth and Dallas, Tex., publish a report of the organization of this company, in part as follows: T. L. Marsalis has sold to New York and Philadelphia parties the two roads running between Dallas and Oak Cliff known as the Dallas & Oak Cliff belt line, and which will hereafter be known as the Dallas & Fort Worth rapid transit. The road will be extended to Fort Worth and probably operated by electricity. Spencer M. Janney, of Philadelphia, President of the Huntingon & Broad Top, is President of the new company.

Delaware River.—This company, whose road extends from Woodbury to Penn's Grove, will, it is stated, shortly extend its line to Pennsville, N. J., a small town about seven miles south from Penn's Grove, opposite Wilmington, Del. The engineers are now surveying for the extension.

Duluth, Rice Lake & Western.—This company was incorporated in Minnesota last week by Douglas A. Petre, Arthur R. Coleman, William McKinley, Fred. W. Paine and Alfred E. McCordie. The railroad will extend from Duluth to the international boundary via Rice Lake, Minn.

Florida Roads.—Bills have been introduced in the legislature to incorporate the Tampa & Western and the Tampa Suburban railroad companies.

Gulf, Beaumont & Kansas City.—L. J. Kopke, of Beaumont, Tex., has been appointed Chief Engineer of the road and has commenced a preliminary survey of the line north of Beaumont. When J. H. Kirby arrives from Boston the work of construction is expected to commence in earnest. The bonus of $40,000 asked of Beaumont is subscribed.

Holly River Boom & Lumber Company.—This company, which is chartered in Virginia, will build a railroad from the West Virginia & Pittsburgh road, near the point where that line crosses the Elk River, to lands owned by the new company in Braxton County, a distance of about 17 miles. It is reported that the West Virginia & Pittsburgh Co. has proposed that if the Holly River Company will continue the line to Pickens, the present terminus of the Buckhannon branch of the West Virginia & Pittsburg road, the latter will operate the new road for general traffic. W. J. Marsh and J. H. Palmer, of New York, are the principal owners.

Indianapolis, Bloomington & Bedford.—A subsidy of $72,000 was voted by Monroe County, Ind., last week in aid of this projected road. The line will extend from

Indianapolis southwest to Bedford, Ind., about 80 miles. Benjamin Thompson, of Bloomington, Ind., is General Manager.

Jackson.—The organization of this company, to build four miles of railroad to the Yazoo & Mississippi Valley road, has been completed, and F. Herr, of 284 Baronne street, New Orleans, has been elected President. Jackson, from which the railroad will start, is an inland town of 2,000 to 2,500 population, and the railroad connection will be at McManns, La. Thirty-pound rails will be used. The construction work will probably not begin before Nov. 11.

Lackawanna, Catskill Mountain & Boston.—The New York State Railroad Commission has granted the application of this company for permission to build a road, starting from Deposit, N. Y., near the Pennsylvania line, and extending up the west branch of the Delaware River through the Schoharie Valley to Central Bridge, and thence to Rotterdam Junction to connect with the Fitchburg Railroad.

Long Island.—There is every probability that the company will extend its tracks to Easthampton, Amagansett and Fort Pond Bay. President Corbin has promised to build the line if the residents furnish the right of way. Easthampton and Amagansett are popular summer resorts. The present terminus of the road is six miles from Easthampton, and the proposed work will include the building of 20 miles of road.

Missouri & Tide Water.—The name of the railroad formerly called the Springfield, Sedalia, Marshall & Northern has been changed as above. The grading was begun at Sedalia last week, but it was suspended in a day or two on account of right of way troubles. It is stated, however, that work will be resumed in a few days at Republic, Mo., and at Springfield, James Reilly being the contractor for the latter work.

National Tehuantepec.—The Northern Division of the railroad, completed to the Jaltepec River, was turned over to the Government representative recently by the contractors and has been accepted by the Mexican Government, and will be immediately placed in regular operation. The force of laborers employed on the Southern Division of the road has been doubled, and it will be completed by Sept. 1.

New Orleans & Northwestern.—It is reported that the directors decided at the recent annual meeting to complete the extension from Rayville to Collins, La., during the coming summer. One of the officers states that the rails for the 18 miles of road which it is proposed to build will be ordered at once. The extension to Collins will give a connection with the Houston Central, Arkansas & Northern road, one of the operated lines of the Missouri Pacific.

New Roads.—The five-mile narrow gauge railroad from Huntsville, Tex., begun sometime ago under the authority of the Texas Board of State Penitentiaries, was completed on April 17, when the track reached the timber lands five miles from the town, which will be the terminus.

It is stated that work on the railroad from Kingfield, Me., on the Franklin & Megantic road, to Jerusalem, will begin soon. The Maine Central has given $1,000 a mile, and the Sandy River Railroad has given $2,500. In all $25,000 of the $30,000 required has been raised.

James M. Smith, of Oglethorpe, Ga., will probably soon commence building a road from Five Forks to Danielsville, Ga., a distance of about 12 miles.

Nova Scotia.—A dispatch from Halifax, N. S., reports that Henry Alton, of New York, is now in that city on business in connection with the plans for building about 50 miles of railroad in Nova Scotia from Louisburg. Surveys are now being made, and the contracts for a part of the line are reported let to Killen & Child, of New York City.

Oscawana & Cornell.—The construction work on this line was commenced early this month with a force of about 100 men, which will shortly be increased to 350 men. The contractors are Adolphus Marshall, of Rondout, N. Y., and Herman Force, of Lodi, N. J. The road is being built from Oscawana on the New York Central & Hudson River road, to the site of the new Cornell Croton aqueduct dam, a distance of six miles. The line is located in a valley through country very rough and rocky. The chief business will be from hauling masonry to the site of the dam. The maximum grades are 104 ft. to the mile, and the maximum curves 10 degrees. It is proposed to build a dock on Oscawana Island about 200 ft. long and 75 ft. wide. W. H. Gale, of 44 Pine street, New York, is President, and James S. Haring, of Suffern, N. Y., is Chief Engineer.

Pecos Valley.—Thomas Harris is in charge of the engineering party now engaged in surveying the projected northern extension from Eddy, N. Mex., north through Eddy and Chaves counties. It is not announced what place will be the objective point of the surveys, but probably the line will be run to Roswell, N. Mex.

Pennsylvania.—The Fort Washington branch of the road extending from Allen's Lane Station, near Philadelphia, on the Chestnut Hill line, to a junction with the Trenton cut-off, near Fort Washington, will probably be open for travel about June 1. The grading has been completed, and the material for tracklaying is on hand, though not yet distributed. Some track has already been laid from the Allen's Lane end of the road.

Phillipsburg & Houtzdale Connecting.—E. A. Tennis of Thompsontown, Pa., was on April 20 awarded the contract for building 20 miles of this line, which will connect with the Beech Creek road at Phillipsburg, Pa., and extend to Jaynesville. Work began April 26. Samuel P. Langdon is President of the company.

Portland, Monterey & Gulf.—The company filed a charter in Texas last week to build the railroad, already described in these columns, from Portland or Victoria, on Corpus Christi Bay, south to a point on the Rio Grande River, a distance of about 150 miles. John Willacy, of Victoria, is the General Manager.

Roanoke & Southern.—A branch of this line is to be built from Roanoke, Va., about ten miles south to iron mines owned by the Castle Rock Mining Company. This road is now operated by the Norfolk & Western, and the extension will be built by that company.

Santa Fe, Prescott & Phœnix.—The tracklaying on the first section south of Ash Fork reached Prescott, Ariz., last week, and regular trains will begin running this week from the connection with the Atlantic & Pacific, at Ash Fork, south to Phœnix, 60 miles. The construction work is going on rapidly on the Southern Division, between Prescott and Phœnix.

Snow Fork & Hocking.—This project has been apparently revived, and it is reported that contracts for grading the line from Shawnee south to Chauncey, O., near Athens, are now being let. The road, if completed, will be operated as a branch of the Baltimore & Ohio, and it is intended to reach coal fields in the Hocking region. The surveys were made early in 1892. David Lee, of Zanesville, O., is President.

Teche Railroad & Sugar Co.—This company, incorporated with Dr. Seaman A. Knapp, President; George Horridge, Vice-President, and Bradford Knapp, Secretary, of Lake Charles, La., intends building a railroad from Huron Plantation, in St. Martin's Parish, to a point on the Bayou Courtableau and thence to a point on the Louisiana & Western Railroad.

Velasco Terminal.—The directors have called a stockholders' meeting to be held in Velasco, June 12, to authorize the issue of bonds to an amount not to exceed $15,000 a mile upon the road now completed.

Wabash.—The new short line of the Wabash between Chicago and Detroit will open for regular business on Sunday, April 30. The intentions were to begin operations April 23, but it was found impossible to do so. The first through train over the new line arrived in Chicago on the morning of April 21. The distance between Chicago and Detroit by this route is 272 miles, making it 13 miles shorter than any other line. The roadbed is in good shape considering its newness. Grade crossings have been avoided, where possible, by going overhead, and where it was necessary to make crossings at grade they were supplied with interlocking devices. The line is particularly free from curves, and the maximum grade is 26 ft. to the mile.

Wichita Falls & Oklahoma.—A company called the Wichita Falls & Oklahoma was organized at Whichita Falls, Tex., last week, for the purpose of building from that point to Ringgold where a connection with both the Texas extension of the Chicago, Rock Island & Pacific and the Missouri, Kansas & Texas will be made.

GENERAL RAILROAD NEWS.

Augusta Southern.—The reorganization of the Augusta, Gibson & Sandersville road will probably be carried through under the above title. A meeting of the purchasers at foreclosure sale was held recently in New York to complete plans for the reorganization. It is expected that the road between Augusta and Sandersville, 80 miles, at present of 3 ft. gauge, will be made a standard gauge line, and an extension built from Sandersville.

Boston & Maine.—The Massachusetts House of Representatives has passed the consolidation bill, which gives the Boston & Maine road authority to lease or purchase the Concord & Montreal road. Having now passed both branches of the legislature it goes to the Governor for his signature.

Central of Georgia.—On the application of Henry Crawford, counsel for the Richmond Terminal Co., Justice Jackson, sitting as Associate Justice of the Circuit Court, has fixed May 2 as the date when he will hear the motions submitted by Mr. Crawford asking for the cancellation of the receivership. The negotiations by Receiver Comer of loans through H. B. Hollins & Co. and the Mercantile Trust Co. are opposed by Mr. Crawford, as counsel, and he asks for an order to restrain the carrying out of the contract.

Chicago, Burlington & Quincy.—The pamphlet report for the year 1892 has been issued. It shows that the company earned during the year a little more than six per cent. on the stock, after providing for fixed charges and sinking funds, and not including land receipts. Following is a comparative statement of earnings:

	1892.	1891.	Inc. or dec.	
Miles oper.	5,556	5,324	I.	332
Gross earn.	$33,002,383	$27,916,127	I.	$5,086,266
Oper. exp. and taxes.	22,469,010	18,549,257	I.	3,919,753
Net earn.	$10,533,383	$9,366,870	I.	$1,166,513
Misc. income	1,281,817	1,371,627	D.	89,810
Total net earn.	$11,815,200	$10,738,497	I.	$1,076,703
Fixed charges	7,193,497	6,812,285	I.	381,112
Dividends (5)	2,819,922	(4½) 3,246,685	I.	573,237
Surplus	$801,781	$679,427	I.	$122,354

Louisville, New Albany & Chicago.—Judge Bartholomew, of the Indiana State Court, in which the suit for a Receiver for this road was begun by W. J. Craig a few weeks ago, has granted the petition of Samuel Thomas and Calvin Brice for the transfer of the suits to the United States Courts. No importance is attached to this suit.

New York, Susquehanna & Western.—The stockholders voted at a special meeting held in Jersey City on April 25 to consolidate with the Hudson River Railroad & Terminal Co., which owns 62 acres of water front between Weehawken and Fort Lee and has been digging a tunnel through the Palisades to connect its wharves with the Susquehanna road. Out of 80,000 shares of preferred stock 73,205 were voted for the consolidation, and of the 130,000 shares of common stock 103,171 were voted.

Northern Pacific.—The statement of earnings for February, including the Wisconsin Central lines, is as follows:

February:	1893.	1892.	Inc. or dec.	
Oper. Mileage	5,247	5,222	I.	25
Gross earn.	$1,578,016	$1,946,325	D.	$418,309
Oper. expen.	1,201,071	1,291,189	D.	90,118
Net earn.	$376,945	$655,136	D.	$228,191
Other income	170,687	181,950	D.	11,263
Total net earn.	497,632	837,087	D.	339,455
Int. tax, rent, etc.	1,096,432	1,127,038	D.	30,606
Deficit	$598,800	$289,951	I.	$308,849
Eight months to Feb. 28:				
Gross earn	$20,652,222	$20,900,612	D.	$248,390
Oper. expen.	12,298,366	12,323,745	D.	25,379
Net earn.	$8,353,856	$8,576,867	D.	$223,011

Ohio Southern.—The annual statement shows gross earnings for the fiscal year ending Dec. 31, 1892, of $711,541, an increase over the previous year of $92,882; the operating expenses, including taxes, were $349,491, an increase of $17,106 over last year. The net earnings were $362,049, being an increase of $75,776. The surplus, after deducting fixed charges, was $135,249, as against $59,473 for the previous year.

Philadelphia & Reading.—The Receivers have petitioned the United States Circuit Court for authority to release from the Reading's control the Easton & Amboy and Lehigh Valley Terminal roads and to carry out instead a trackage agreement. These roads are New Jersey lines of the Lehigh Valley system. The Reading Receivers desire to make the surrender to avoid further litigation in New Jersey.

Pittsburgh, Shenango & Lake Erie.—At the meeting held in Meadville, Pa., April 22, more than two-thirds of the stock was voted in favor of the consolidation of the terminal companies controlled by the company. These are the Erie Terminal and the Conneaut Terminal.

Port Royal & Augusta.—Judge Pardee, of the United States Court at Savannah, has removed H. M. Comer as Receiver of the above railroad. This leaves Superintendent J. H. Averill, the Receiver appointed by the State Court in South Carolina, in the suit brought by that state, in charge of the line as Receiver.

Pullman's Palace Car Co.—At the annual meeting of the stockholders at Chicago, April 20, it was decided to increase the capital stock 20 per cent. The new issue of $6,000,000 will be offered to the stockholders at par on May 1, and they will have the privilege of subscribing for one share for each five shares they own. A quarterly dividend of two per cent., payable May 15, was declared.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, April 25, 1893.

An unfortunate local disturbance over passenger rates in Colorado and Utah Territory, between the Denver & Rio Grande and the Colorado Midland, has resulted in the indefinite postponement of the amalgamation of the Trans-Missouri territory and the Western Passenger Association and consequently also the adoption by the association of any agreed association basis of general rates for World's Fair traffic. While the situation is undoubtedly a serious one there is a probability that the magnitude of the interests at stake will induce the Colorado roads to settle their local disagreements rather than imperil the whole western situation. The revision of the agreement was, as heretofore stated, practically completed, the date on which it was to have become effective having been fixed for April 20, when the Denver & Rio Grande gave notice that it could not become a party to it so long as its relations with the Colorado Midland remained unfriendly. Prior to taking this position the Denver & Rio Grande had insisted that the Colorado-Utah traffic should be exempted from the new agreement, which had been conceded.

The trouble in Colorado grows out of a demand on the part of the Colorado Midland for a reduction in the number of trains run by the Denver & Rio Grande which was refused. The Midland then made some reductions which have entirely demoralized local passenger rates in that territory. This demoralization the Rio Grande now gives as a reason for not coming into the association. Following this notice on the part of the Rio Grande the Santa Fé gave formal notice on April 20 that it considered that its interests demanded that it should be free to meet openly all rates made by its competitors, not only west of the Missouri River, but east as well, and on this account it would cease to be a member of the Western Passenger Association on April 30. This withdrawal necessitated the abandonment of the date fixed for making effective the revised agreement and the lines voted to postpone indefinitely such date, which leaves the present agreement in effect as before, and the new agreement adopted to become effective upon a date yet to be fixed. This, of course, upset all plans for the making of trans-Missouri rates for the Fair by association agreement. The lines, with the exception of the Rio Grande, then had a meeting and endeavored to fix the rates for themselves by agreement. A majority of the committee reported in favor of 20 per cent. reduction from Pacific Coast points, Colorado and Utah and intermediate points to the Missouri River; making the through rates to Chicago by adding the already established rates east of the Missouri River. Right here the Burlington and the Rock Island found themselves in a predicament. Their only western outlet is the Denver & Rio Grande. They naturally want to protect that, but at the same time they would like to act in unison with their other competitors. As the easiest way out of the dilemma, they agreed on a minority report that the proposed rates were too low, which gave them an opportunity to keep out of the agreement. The other lines will go ahead and put in the rates agreed upon, but their maintenance depends upon the speedy settlement of the Colorado disagreement. If the Colorado roads do not come to an agreement it is quite probable that the Rio Grande and Atchison will force the extension of the disturbance over the entire territory west of the Mississippi River.

In the East the roads are not quite a unit as to the handling of the World's Fair traffic, and another meeting of the Joint Committee has been called in New York for April 28. It is understood that the standard lines had contracts out for stop-over privileges at the time they agreed not to make any stop-overs, and as these are coming to light the differential lines are insisting that the agreement must stand or fall as a whole.

The Michigan lines have agreed to round trip rates to the World's Fair of 85 per cent. of the double one-way rate, 30-day limit, first class; 80 per cent. of the double one-way rate, good for six months and no sleeping car privileges; 75 per cent. of the rates, 30-day limit, no sleeping car privileges; 66⅔ per cent., seven-day limit, good only on special excursion trains.

Western Freight Association lines have agreed to the usual proportional rates on lake and rail traffic and have bound themselves as usual to a resolution that they will maintain the rates fixed and will not absorb anything tending to cut the rates. This is the usual proceeding at the commencement of navigation.

Texas Car Service Association.

Representatives of the principal roads of Texas met in Houston on April 15 and organized the Texas Car Service Association. The roads represented were the Texas & New Orleans; Galveston, Harrisburg & San Antonio; Sabine & East Texas; Gulf, West Texas & Pacific; Texas Transportation Company; Central Texas; Texas Trunk; Forth Worth & New Orleans; San Antonio & Aransas Pass; Fort Worth & Denver City; International & Great Northern; Texas Central; Missouri, Kansas & Texas; North Galvestion, Houston & Kansas City; Sherman, Shreveport & Southern, and the St. Louis & Southwestern. Maj. A. H. Swanson was made General Manager. He will have his office in Houston and have assistants at such points as may be found necessary.